THE

CANADIAN JOURNAL

OF

INDUSTRY, SCIENCE, AND ART:

CONDUCTED BY

THE EDITING COMMITTEE OF THE CANADIAN INSTITUTE.

New Series. Number XIII.

JANUARY, 1858.

TORONTO:

PRINTED FOR THE CANADIAN INSTITUTE,

BY LOVELL AND GIBSON, YONGE STREET.

The Gift of the
Canadian
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Received
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July 29, Oct. 5, Dec. 27
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⁂ *Communications for the Journal to be addressed to the General Editor,* DR. WILSON, *University College, Toronto.*

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No. XIII.—JANUARY, 1858.

ON THE PROBABLE SUBDIVISION OF THE LAURENTIAN ROCKS OF CANADA.

BY SIR WILLIAM E. LOGAN, F. R. S.,
DIRECTOR OF THE GEOLOGICAL SURVEY OF CANADA.

Read before the American Association for the Advancement of Science, at Montreal, August 14th, 1857.

I have already indicated the probable separation of the Laurentian rocks of Canada into two great groups: that characterized by the presence of much lime and that without; but from recent investigation, the result of which has just been reported to the Canadian Government, it appears to me almost certain that the former of these two great groups will be capable of subdivision, and that some of its bands of limestone, with their associate strata, are of sufficient importance to be represented separately on the map. Having followed out one of these bands of limestone through all its windings, for a distance of eighty miles, the object of the present paper is to exhibit to the Section its geographical distribution, and the forms it presents in the physical structure of the region which it characterises. What at first appear to be two bands of these limestones, emerge from beneath the Lower Silurian series in the township of Grenville, on the Ottawa, and run into the interior parallel to one another, striking N. N. E. They are about two miles separated from one another, and both, with the gneiss between, dip in one direction, which is N.N.W.,

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already cited by Liddell and Scott, and φῶδον, given by Suidas. QVECVMQ I regard as a contracted form of *quæcumque*, the E being used for AE, and the final Q for QVE, both of which uses are familiar to those conversant with Latin epigraphy. DELICTA is the participle of *delinquere;* or is used for *derelicta* from *derelinquere*, as in Ennius "delicto Coclite" (if that be the true reading) for "derelicto Coclite;" or it may be that the correct reading is RELICTA. The word thus admits of two interpretations, either "badly treated" or "given up." The meaning of the inscription, according to the reading which I propose, may be expressed thus: "The blistering (collyrium) of Titus Junianus for such (hopeless) cases as have been given up by the physicians."

If PHOEBVM be the true reading, I am inclined to regard the designation as selected with a view to the supposed superiority of Apollo to his son Æsculapius, and of course to the *medici* the sons of Æsculapius.

This universal specific was, perhaps, used on the principle of counter-irritation. Another panacea is noticed on the stamp found near Cirencester (the ancient Corinium) in 1818, and described by Buckman and Newmarch:

MINERVALIS MELINV [m]
AD OMNEM DOLOREM.

It may, I think, be safely inferred from the Bath inscription, if my interpretation be correct, that the stamp did not belong to a regular *medicus*, but to an empiric, possibly one of the *iatroliptæ*.

The difficulty in interpreting another legend on this stamp arises from the impossibility of determining the true reading of one of the words. In the books of the Society of Antiquaries the legend is given thus:

T. IVNIANI DIEXVM AD VETeRES CICATRICES.

Dr. Simpson conjectures DIAMYSVM (the name of a well known collyrium) for the inexplicable DIEXVM; but from the copy by Gough it appears that the letters between D and M are in a rude Britanno-Roman character, and that "the disputed word may perhaps be more correctly read DRYCVM or DRYXVM," which Dr. S. interprets as a preparation from the bark, acorn, or galls of the *Drys*, *i.e.* oak. Can it be that the word is formed from *Druidæ* or *Dryidæ*, and that both the appellation and the characters were adopted with a view to securing its sale amongst the native population?

(2.) In Nether Hall is preserved a Roman altar, found in the camp at Maryport, *(Olenacum,)* which bears the following inscription:

DEAE
SETLO
CENIAE
L. ABAR
EVS CE
V. S. L. M.

Dr. Bruce, in his very interesting and learned description of "the Roman Wall" (2nd Edit. London, 1853, p. 400,) has figured it, and offers the following remark relative to the interpretation:

"Nothing is known of the goddess Setlocenia, to whom the altar seems to have been dedicated by Lucius Abareus, a centurion."

Although I have not seen the stone, I have little doubt that *Setlocenia,* which has been regarded* as the name of an unknown goddess, is composed of significant parts, and should be expanded into SANCTAE ET LOCI GENIO.

It is impossible to determine, without examination of the original, the exact appropriation of the letters, but it seems to me plain that S is for *Sanctæ,* (as is frequently found,) and *et* unaltered, whilst it appears probable that LO is for *loci;* that C is a mistake for G, thus giving GEN for *genio;* that I is a mistake for L or T, the centurion's names being *Lucius* or *Titus Ælius Abareus;* or GENI for *genio,* without any prænomen. CE is of course for *Centurio,* and V.S.L.M the usual final formula.

Another reading, which might be suggested, of GENIAE as the feminine form of *genius,* is liable to the objection, that the word never occurs, so far as I am aware, in any ancient author or inscription. The only place in which I have seen it, is Heyne's note on Tibullus, IV. 6 1.

(3.) Some of the most interesting and abundant memorials of the military occupation of Britain by the Romans, are connected with the Tungrian auxiliaries, mentioned by Tacitus (Agric. 36,) in his description of the defeat of Galgacus by Agricola. Amongst the numerous altars erected by members of these cohorts are two, found at Birrens, (*Blatum Bulgium,*) in Annandale, Scotland, which present similar difficulties of interpretation. The inscriptions on them (as given in Stuart's "Caledonia Romana," Edinburgh, 1852, p. 128, 2nd edition, by Prof. Thomson, King's College, Aberdeen,) are:

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* Vide Camden's Brit. Ed. Gough, III. p. 438.

(1.)	(2.)
DEAE VIRADES	DEAE RICAGM
THI PAGVS CON	BEDAE PAGVS
DRVSTIS MILI	VELLAVS MILIT
IN COH II TVN	COH II TVNG
GR. SVB SIVO	V. S. L. M.
AVSPICE PR	
AEFE.	

Stuart's observations on No. (1) are:

"With some few alterations—and considerable allowance made for the errors that may occur in deciphering those time-worn legends—the [inscription] may be translated somewhat as follows:—"*To the goddess (or deified)* – – – –, *Thiasus Pagus Condrustus, a soldier of the second Cohort of the Tungrian auxiliaries, commanded by Sivus Auspicius, Prefect, (dedicates this altar.)* We are at a loss to discover the meaning of the word VIRADES; perhaps it has been erroneously copied [by Pennant,] and ought to be read DRYADES or OREADES; in which case the difficulty vanishes, and we have the German soldier offering up his vows to a particular and perhaps tutelary class of the *Deæ Nymphæ*."

On the inscription No. (2) Prof. Thomson offers the following note:

"The altar appears to be dedicated to some provincial deity, possibly Ricagmena Beda by name, by a soldier of the Second Cohort of Tungrians, Pagus Vellaus, (vide Preh. Ann. p. 398,) or, to avoid imputing a serious grammatical error to the sculptor, by *two* soldiers, Vellaus and Pagus."

Subjoined is the passage in the "Prehistoric Annals of Scotland," to which reference is made in the note:

"It appears to be dedicated by Pagus Vellaus to one of those obscure local deities, apparently provincial names with Latin terminations, which are more familiar than intelligible to the antiquary. It belongs to a class of Romano-British relics which is peculiarly interesting, notwithstanding the obscurity of their dedications, as the transition-link between the Roman and British mythology. These altars of the adopted native deities are generally rude and inferior in design, as if indicative of their having their origin in the piety of some provincial legionary subaltern. In the obscure gods and goddesses, thus commemorated, we most probably recognise the names of favourite local divinities of the Romanised Britons, originating for the most part from the adoption into the tolerant Pantheon of Rome of the older objects of native superstitious reverence."

Henzen (in the 3rd vol. of Orelli's Inscrip. Lat. *Turici*, 1856) gives the first inscription from the 1st Edit. of Stuart's Caledonia Romana, and subjoins the brief notes:

"Nomina barbara fortasse etiam corrupta." "MILIT (*avit*)" "TVNGROR." "corr. PRAEF, cujus nomen male lectum est."

Having stated the opinions of others, I shall now proceed to offer my own views on the subject.

PAGVS, in both inscriptions, I regard, not as a proper name, but as the ordinary term, used by Cæsar and Tacitus, for "a district." Vide Cæsar, B.G. i. 37; iv. 1; and Tacitus, Germ. 39. CONDRVSTIS (or perhaps CONDRVSTVS—a form used in the middle ages) and VELLAVS are, in my judgment, ethnic adjectives, the former derived from CONDRUSI, the latter from VELLAI. The *Condrusi* and *Vellai* are both mentioned by Cæsar (B.G. ii. 4, and vii., 75.) The *Condrusi* were neighbours of the *Eburones*, who were succeeded by the *Tungri*. The *Vellai*, *Vellavi*, *Vellavii*, *Vellauni*, or *Velauni* were a people of Gallia Celtica, or Aquitania, as the latter term was extended in signification under Augustus.

They are noticed by Strabo, (iv. 2.) and Pliny, (iii. 20,) and their name is found in inscriptions: e. gr.

ETRVSCILLAE
AVG· CONIVGI
AVG· N̄
CIVITAS VELLAVOR
LIBERA.

The Etruscilla mentioned in this inscription is Herennia Cupressenia Etruscilla, the wife of the emperor Trajanus Decius, which fixes the date to the middle of the 3rd century after Christ.

Libera of course indicates the independence of the Vellavi, which they enjoyed, however, in the time of Strabo, although in that of Cæsar, (B.G. vii. 75,) they were in subjection to the Arverni.

For other inscriptions relative to this people, vide Mem. des antiquaires de France, iv., pp. 87 and 528.

MILI (or MILT) and MILIT are abbreviations of *militans*—not of *militavit*, as Henzen states, for the verb is in the omitted final formula—SIVO (or SIVOD, the ancient form of the dative and ablative, as given in the illustration,) is an erroneous reading of SILVIO, as appears from the following inscription also found at Birrens:

MARTI ET VICTO
RIAE· AVG· C· RAE
TI MILIT· IN COH
II TVNGR· CVI·
PRAEEST SILVIVS
AVSPEX PRAEF·
V S L M.

The names of the goddesses, as they appear in the inscriptions, I regard as VIRADESTHI, (or VIRADETHI, as it is given in the lithographic representation in the "Caledonia Romana,") and RICAGM-

BEDAE, or perhaps the latter is formed of two words. Nothing is known of these deities. They may possibly have been, connected with the towns Virodunum (*Verdun*) and Rigomagus (*Remagen*); and it appears to me more probable, that they were local deities of those who erected the altars, than that they were adopted from the Britons. If the reference to *Rigomagus* be correct, it may be inferred that the Vellavians, serving in a Tungrian cohort, adopted a Tungrian deity.

According to the views which I have stated above, I should translate the inscriptions thus:

(1.) "To the goddess Viradesthi (or Viradethi) the Condrusian district, (*i. e.* the men from that district) serving in the Second Cohort of the Tungrians, under the command of Silvius Auspex Præfect."

(2.) "To the goddess Ricagm*a*beda the Vellavian district, (*i. e.* the men from that district) serving in the Second Cohort of the Tungrians," &c., &c.

Since the foregoing remarks were written, I have seen the 3rd vol., Part iv. of the "Collectanea Antiqua" by Mr. C. Roach Smith, in which that learned and ingenious antiquary offers his views relative to the two altars which have been under consideration. From these I find that he has anticipated me as to the interpretation of *pagus*, the reference to *Rigomagus*, and the emendation of the præfect's name. After a careful consideration, however, of his interpretations, I see no reason for changing the opinions which I had previously expressed.

Subjoined are his remarks:

"I propose reading it (inscription 2,) thus: 'To the Goddess Rieamaga of the district (*Pagus*) of Beda, Vellaus, serving in the Second Cohort of the Tungri, in discharge of a vow, willingly dedicates.' The *Bedæ Pagus* was a tract on the line of the Roman road, from Treves to Cologne, some trace of the original name of which is retained in that of its modern representative Bitburg. In this region was a station or town, called *Rigomagus* or *Ricomagus*; and to this place, I suspect, may the Goddess of the Birrens altar be referred; especially as the dedicator was a Tungrian. The word *pagus* is not unfrequently found in the sense in which it here appears in similar inscriptions. Mr. Stuart gives one, copied by Pennant, and also found at Birrens, which was erected also by a Tungrian, to the goddess of the Viradesthian (?) Pagus. Mr. Stuart's reading of the first part is evidently erroneous; and equally so *Sivus Auspicius*, as we may be assured by fig. 2 of our plate" (giving the inscription already noticed,) "where we have the same prefect in the nominative case, *Silvius Auspex*."

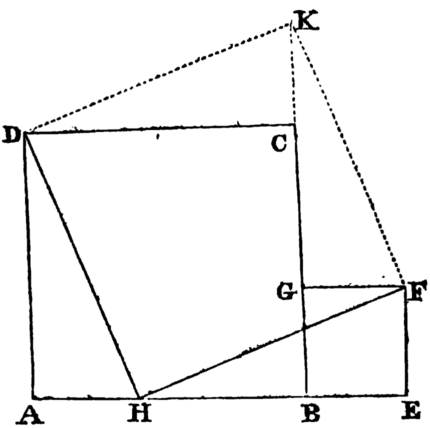
A decisive objection to Mr. Roach Smith's interpretations is that they

are inconsistent with *pagus* in the nominative case. His reference to *Bedæ Pagus* seems to confirm the conjecture, that *Ricagmbedæ* was composed of two words, of which the latter *bedæ* was the name of the goddess. Hence *Beda vicus*, (now Bitburg), in the route *a Treviris Agrippinam*, as given in the Itinerary of Antoninus, derived its appellation; and from it came *Pagus Bedensis*, which is noticed in Wesseling's note. Vide Vet. Rom. Itiner. *Amstel.* 1735, p. 373.

NOTE ON THE PROPOSITIONS OF PYTHAGORAS AND PAPPUS.

Read before the Canadian Institute, Dec. 19th, 1857.

The following elegant construction is given by Prof. De Morgan in the Quarterly Mathematical Journal, (Vol. I. page 327,) as due to the Astronomer Royal.



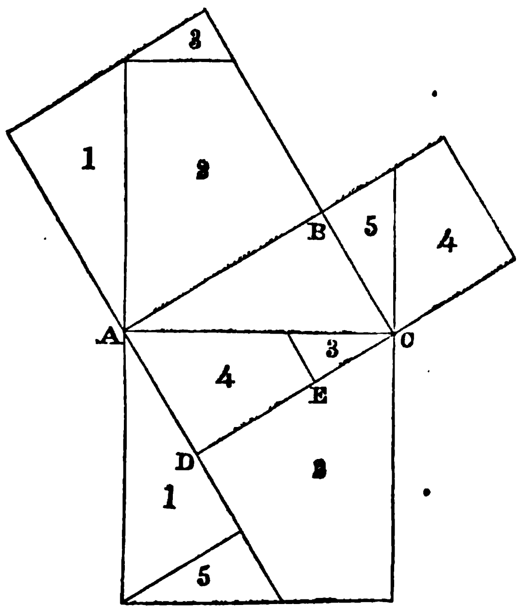
Let A B C D, B E F G be two squares forming a gnomon; take A H equal to B E; join H F, H D. Translate without rotation each of the triangles A H D, H E F along the hypothenuse of the other (coming into the positions indicated by the dotted lines): a square H K is then formed equal to the original two together.

Professor De Morgan remarks that the proof thus obtained of the Pythagorean Proposition (Euclid I. 47) is the simplest that has yet been devised. The original squares are plainly those on the sides of the right-angled triangle H E F, and the new square that on the hypothenuse.

Precisely the same method may be employed when, instead of squares, we have two parallelograms forming a gnomon: in this case the resulting figure will also be a parallelogram, and, adopting the same letters as in the figure, its other side will be equal and parallel to

E C. This affords an easy proof of the well known theorem of Pappus, of which the Pythagorean is a particular case. For, referring to the triangle H E F, (E being not now a right-angle,) the parallelograms are those constructed on the sides H E, E F, and we can change them into any others on the same bases and between the same parallels without altering their areas, the point C remaining also fixed. Also, if the parallelograms be constructed on the outside, the point corresponding to C will be on E C produced backwards to an equal length. Hence we have the following proposition which is that of Pappus slightly extended, "If on the two sides of a triangle as bases any two parallelograms be constructed, (both on the inside, or both on the outside,) they will together be equal to a parallelogram constructed on the base of the triangle and having its other side equal and parallel to the line joining the vertical angle of the triangle with the point which is the intersection of the sides which, in each of the two parallelograms, are opposite to the respective bases."

The following mode of dissecting the square on the hypothenuse so



as to fill up the squares on the sides of a right-angled triangle is probably not new, though I have nowhere met with it. It is at

once deducible from the preceding. In the figure, B is the right angle in the triangle A B C. The lines within the square on the hypothenuse are drawn parallel to the sides of the triangle and D E is taken equal to A D or B C. Precisely the same dissection serves for the proposition of Pappus, the parallelograms constructed on the two sides, and on the outside of the triangle, being first changed into two others (without altering their areas) having their sides coincident in direction with the sides of the triangle. D E is to be taken equal to that side of the parallelogram on whose production it lies, and the figure marked 5 in the parallelogram over the base is to be translated without rotation to its new position at the top of its parallelogram on the side, and not as represented in the figure which is correct only in the case of rectangles. J. B. C.

REVIEWS.

The St. Lawrence and the Saguenay, and other Poems. By Charles Sangster. Kingston, C. W.: John Creighton and John Duff, 1856.

Poems. By Alexander McLauchlan. Toronto: John C. Geikie, 1856.

Oscar and other Poems. By Carroll Ryan: Hamilton, Franklin Press, 1857.

A Song of Charity [*Canadian Edition.*] Toronto: Andrew H. Armour & Co., 1857.

Poetry is the natural progeny of a nation's youth. It is the eldest as well as the fairest, of the offspring of literature; if indeed it be not rather her parent, for songs were sung long before letters were invented. Our Province, however, occupies a singular position in this its Canadian youth. Our schooling has been too much alongside of the elder of Europe's nations, and our individual thoughts partake too largely of the experience which centuries have accumulated around the old Saxon hearth, to admit of the lyrical or epic muse inspiring for us the lay that is born of nature in the true poet's heart. We are past the first poetic birth-time, which pertains to the vigorous infancy of races; we have yet to attain to the era of refinement from which a high civilization educes new phazes of poetic inspiration. We cannot

yet respond, amid these charred stumps and straggling snake-fences of our rough clearings, to Hiawatha's appeal to those:

> Who love the haunts of nature,
> Love the sunshine of the meadow,
> Love the shadow of the forest,
> Love the wind among the branches,
> And the rain-shower and the snow-storm,
> And the rushings of great rivers,
> Through their palisades of pine-trees.

We want our pine-trees for lumber, and so long as they spare us a surplus for kindling wood, we ask no kindling inspiration from them. The rushing of our great rivers we estimate rejoicingly—for their water-privileges. The sunshine of the meadow is very welcome to us —in the hay-harvest; and the poetry of the snow-storm full of the music—of our sleigh-bells. As to our love for the shadow of the forest, that pertains to the romantic simplicity of our squatter stage of infancy, from whence we emerge as fast as possible into the clearing we hew out of it, rejoicing at the crash of falling pines, and keeping time with the music of the axe to the crackling of the logging-pile. We do not mean to say that a poet is an imposibility, amid the rugged realism of this vigorously practical Canada. The ungenial Ayrshire farm of Mosgiel gave no greater promise of a crop of poetry from its bleak and exposed heights before it gave birth to its "Mountain Daisy." But we wonder what would be the estimate of the emigrant settler who should apostrophise the giants of the Canadian back-woods, as they bowed beneath his sturdy stroke, after the fashion of the Ayrshire bard to the "wee, modest, crimson-tipped flower" over which he so reluctantly drove the ploughshare. We question much if our minister of agriculture could be induced to rescue from the rapidly dispersing ordnance reserves a Sabine farm for such a Canadian Virgil.

Such being the present prospects of the poet amongst us, it is not greatly to be wondered at that such poetry as we do produce is less redolent of "the odors of the forest" than of the essences of the drawing-room; and more frequently re-echoes the songs that are to be gathered amid the leaves of the library-shelf, than under those with which the wind sports among the branches whereon song-birds warble their nuptial lays. To the class of poetry which thus repeats the old-world music and song we must assign Mr. Sangster's "St. Lawrence and the Saguenay." It is a pleasant and tasteful depiction of the scenes and associations of our noble river, written in the same stanza as "Childe Harold," and with some echo of its mode of thought,

though lacking the force and pathos of its passionate utterances. But, while we may easily cull from it many graceful versifications of such descriptions as the scenery naturally suggests, we have to search carefully through its hundred and ten stanzas to find any such as might be welcome to the jaded fancy of the old world because of their freshness of wild-wood imagery. Campbell has written, in the same stanza his "Gertrude of Wyoming," and sketched very pretty Indian pastorals, such as delighted the London drawing-rooms into the belief that "the mute Oneyda," and the savage Outallissi were the perfect embodyments of our American Aborigines. They do not, however, awaken any very familiar associations for us to whom the scenery, and even the Savage of the wild West, are not unfamiliar. But the poet of "the St. Lawrence and the Saguenay," sees the river as it is, and not as it was. To him, with all its beauty, it is only the great navigable highway from Ontario to the Sea, with its daily steamers, its wooding stations, its locks and canals. If the Indian lingers among its vanishing woods, it is as the old painted British Druid haunts Avebury or Stonehenge. Here, for example, is the picturing of the thousand Isles :—

Many a tale of legendary lore
Is told of these romantic Isles. The feet
Of the Red Man have pressed each wave-zoned shore,
And many an eye of beauty oft did greet
The painted warriors and their birchen fleet,
As they returned with trophies of the slain.
That race has passed away; their fair retreat
In its primeval loneness smiles again,
Save where some vessel snaps the isle-inwoven chain:

Save where the echo of the huntsman's gun
Startles the wild duck from some shallow nook,
Or the swift hounds' deep baying, as they run,
Rouses the lounging student from his book;
Or where, assembled by some sedgy brook,
A pic-nic party, resting in the shade,
Spring pleasedly to their feet to catch a look
At the strong steamer, through the watery glade,
Ploughing, like a huge serpent from its ambuscade.

Were we to transport the scene to the firth of Clyde, or any other islanded home river, and change only a single term; that of the *Red Man* for the *old Pict*, or even the *Red Gael*, there is nothing in the description that would betray its new-world parentage, At best it is no true Indian, but only the white man dressed in his attire; strip

him of his paint and feathers, and it is our old-world familiar acquaintance. The lay of the Whip-poor-will, instead of some romantic Indian legend, is but a commonplace "Willie and Jeannie" love song, though thus heralded by one of the best stanzas in the poem:

> The Whip-poor-will, among the slumberous trees,
> Flingeth her solitary triple cry
> Upon the busy lips of every breeze,
> That wafts it in wild echoes up the sky,
> And through the answering woods, incessantly.
> Surely some pale Ophelia's spirit wails
> In this remorseless bird's impassioned sigh,
> That like a lost soul haunts the lonely dale!
> *Maiden sing me one of thy pleasing madrigals.*

However much taste and refinement may be displayed in such echoes of the old thought and fancy of Europe, the path to success lies not in this direction for the poet of the new world. To Tennyson this nineteenth century is as fresh an *el dorado* as America was to Cortes or Pizaro. To him it is a thing such as Spenser, or Dryden, or Pope, or Campbell, or Byron, had no knowledge of. Its politics, its geology, its philosophy, its utopian aspirations, its homely fashions and fancies, all yield to his poetic eye suggestive imagery rich with pregnant thought. And surely our new world is not less suggestive. It is not a "Hiawatha" song we demand. The Indian Savage is not the sole native product of the wilds, nor the only poetical thing that meets the eye in the clearings. Here is the Saxon doing once again, what Ælla and Cerdic did in old centuries in that historic isle of the Britons. Science and politics, and many a picturesque phaze of colonial life, all teem with inspiration such as might awake for a Canadian Tennyson another "Sleeping palace" like that from whence he led his happy princess:

> "When far across the hills they went;
> In that new world which is the old."

Poetry, however, is not the crop which it can at all be expected, or indeed desired, that Canadian farmers will cultivate at present. And if we can only reproduce exotic thoughts in verse, it is better on the whole that we should take the foreign originals at first hand. Having, however, stated our feeling in regard to the absence of that originality and individuality of character in "The St. Lawrence," which might have made of such a virgin theme a poetic gem of rarest beauty; we may nevertheless, refer with pleasure to some of its stanzas as grace-

fully commemorating historical features. Here, for example, is a good subject not discreditably dealt with :—

The inconstant moon has passed behind a cloud,
Cape Diamond shows its sombre-colored bust,
As if the mournful night had thrown a shroud
Over this pillar to a hero's dust.
Well may she weep ; hers is no trivial trust;
His cenotaph may crumble on the plain,
Here stands a pile that dares the rebel's lust
For spoliation: one that will remain—
A granite seal—brave Wolfe! set upon Victory's fane.

Quebec! how regally it crowns the height,
Like a tanned giant on a solid throne!
Unmindful of the sanguinary fight,
The roar of cannon mingling with the moan
Of mutilated soldiers years agone,
That gave the place a glory and a name
Among the nations. France was heard to groan;
England rejoiced, but checked the proud acclaim—
A brave young chief had fallen to vindicate her fame.

Wolfe and Montcalm! two nobler names ne'er graced
The page of history, or the hostile plain;
No braver souls the storm of battle faced,
Regardless of the danger or the pain.
They pass'd unto their rest without a stain
Upon their nature or their generous hearts.
One graceful column to the noble twain,
Speaks of a nation's gratitude and starts
The tear that valor claims, and feeling's self imparts.

The poem is manifestly designed as a companion, if not a guide-book, for the voyage to the Saguenay ; and though it has in it none of those magical passages which stir the heart like the sound of a trumpet, it will nevertheless make an agreeable return to the tourist for the small space it claims in his baggage.

Of the poems issued from the Hamilton Franklin Press, the principal one, entitled "*Oscar*," is a picture of the Crimean War, written by a young Canadian, who witnessed and bore a part in the scenes he describes. The plan of his poem, however, embraces a sketch of Canadian scenery, as noted by the imaginary hero, on his way to the seat of war, and so furnishes another view of the same picturesque and historic landscape which has been already drawn by the poetic pen-

cil of Mr. Sangster. Here, for example, is Mr. Ryan's sketch of the Thousand Isles:—

Now Fairy Land is gained—the Thousand Isles—
Amid whose cedar shades sweet Nature smiles
In all the beauty of a scene unchanged,
As when the Indian warrior ranged
From isle to isle, long centuries ago,
And chased, with swift canoe, the nimble doe.
Those shady rocks the softest sound prolong,
As when they echoed to the Squaw's low song,
Who dipped her paddle in the dancing stream,
And watched the sun's last lingering beam,
As he, behind the forests of the west,
In dazzling glory slowly sank to rest.
Each isle an emerald, each rock a gem,
Which forms proud Nature's own bright diadem!
Those wilds again the Indian ne'er will know,
Nor will those waters, in their joyous flow
Bear savage forms unto the depths below.

Niagara is described, or rather soliloquised. Ontario, the St. Lawrence, its Rapids, and the scenes along its banks, all pass in review here, as in the former poem; and Canada itself is apostrophised in terms more loving than original, and with an occasional lameness in the prosody, here as elsewhere somewhat detrimental to the music of the verse:—

Hail! Canada, my own, my native land!
Land of a thousand floods sublimely grand!
Upon this world, on nation, land, or clime,
Has nature lavished gifts more wild, sublime;
Nor blest with brighter hopes her fertile vales,
Or wafted over hills more healthy gales.
Thy boundless wilds as yet untrod, unknown,
Industry soon will rear a joyous home;
Those fertile tracts where axe was never heard,
Where securely sings the native forest bird;
Where swiftly bounds the deer o'er leagues untold,
Wait but for man to yield their hidden gold.
Oh! glorious, happy West fore'er adieu!
Where'er I wander I will turn to you,
And, in mem'ry, thy beauties call to view.

The patriotism is here, certainly preferable to the poetry, even though the latter does recall lines not less patriotic, with which the sixth canto of the "lay of the last Ministrel" is preluded. But, pass-

ing onward down the St. Lawrence, here is the younger poet's picturing of the historic associations of the heights of Cape Diamond:—

See now Quebec with mighty grandeur rear
Its gloomy head—loom sternly in the air!
And from the awful height look proudly down
Upon St. Lawrence with a watchful frown;
Where 'neath its guarding shade securely ride
A thousand vessels on the heaving tide.
This Oscar saw, and stood to view the height
Where Fraser's clans had climbed that glorious night
Up the craggy steep to Abraham's plains,
And hid the verdant sod with bloody stains.
The chivalrous Montcalm, though hasty, brave,
Fought well, his noble post and cause to save;
To every deadly charge his men led on,
And nobly fought amid the clashing throng.
Proudly he died, though not in victory's arms,
Glorious he fell 'midst battle's wild alarms!
Nor did Death's terrors his manly bosom mock—
He died defeated nor survived the shock.

Peace to the warrior hero's shade—
Bright be his wreath, its glories never fade!
Wolfe the true, the noble, generous, brave,
Thou hast all earth can give—a hero's grave.
For this have kings and monarchs vainly sighed.
The tyrant's tomb by deeper stains was dyed:
A tear of joy, not grief, bedews his pall,
A prayer from earth thanks Heaven for his fall.
A lowly poet a chaplet fain would twine
Unto a name as bright and pure as thine.

* * * * * *

Proud Britain's standard, waving from the height
O'erlooks the glorious scene with conscious might;
Flag borne triumphant over sea and land,
And kiss'd the breeze on every foreign strand;
Serenely spread out to the sweeping gale,
Beholds the proud St. Lawrence' mighty vale.
Its wide-spread folds, high above all unfurl'd
Bids stern defiance to the envious world.
Here a true patriot justly would exclaim,
Let Liberty and Truth wash out the stain
That yet upon its mighty folds remain.
Long may true freedom 'neath its shade repose,
Twined round her brow, the shamrock, thistle, rose.
As once it was, may it ne'er again be grasp'd
To mark blood and ruin where'er it passed.

From off point Diamond's peak a booming gun,
With loud report, salutes the setting sun;
Through the ambient air mellow, clear and sweet,
The bugle's note, re-echoed, sounds retreat.

We would not willingly quarrel with a Canadian poet inspired by loyal and patriotic sentiments such as these; but we venture to think that a prose narrative of the Crimean Campaign, from one of ourselves who had borne a share in its sufferings and its triumphs, would have won the suffrages of a thousand Canadian readers for one who will be tempted to the perusal of "Oscar's" poetic experiences. Nor would such a narrative have been the less welcome for his enthusiastic apostrophe to the beauties of our noble St. Lawrence, though uttered only in eloquent prose. We may be permitted to say here once more, in the words of "Aurora Leigh":—

Young men
Too often sow their wild oats in tame verse,
Before they sit down under their own vine
And live for use. Alas, near all the birds
Will sing at dawn,—and yet we do not take
The chaffering swallow for the holy lark.

The poems of Alexander McLachlan are designated in the motto of their title page as "hamely rustic jingle," and as the former volumes are composed after the model of English poets of the beginning of the century, this is a faint echo of Allan Ramsay and Fergusson,—we can scarcely say of Burns: though some of the subjects are probably suggested by his choice of themes, *e.g.* "The Grieve; or the Lamentation of old Jawbaws," which thus begins:

I dinna ken what tempted me
To venture owre the raging sea;
To come awa' to to thir back wuds,
To live in poverty and dudds.
* * * * *

But here, e'en those wha rule the nation
Are driving on some speculation;
Aye, e'en the big parliamenter
Will trade and cheat, like a tramp tinker.
The biggest man thinks nocht degrading—

This it will be seen is a genuine, if not a very poetical Canadian glimpse of things as they are, and the curious reader may find more of the like kind in the same volume.

Craving as we do a native poetry, if we are to have Canadian poetry at all, The "Song of Charity" takes us by guile. The dedication of the tastefully executed volume "to kind friends in Orillia, Canada West," tells us that the poem was "composed in chief part, during a summer's holiday, on the waters and amidst the islets of little Lake Couchiching." Here accordingly is genuine native inspiration. We are gliding, with the author in his birch canoe, over the picturesque lake, and hailing the Indian as he silently paddles past us, under the lee of the wooded islands, from the prettily named Orillia—so called after a favorite native flower,—to his own scattered Indian lodges at Rama. We turn the page, and, as we expected, we are in the forest:

The forest's faëry solitude,
The violet's haunt be mine;
Where call the free in merry mood
From dawn till day's decline!
All gentle creatures gather there
From leafy nest and mossy lair;
The little snakelet, golden and green,
The pointed grass glides swift between;
And there the quaint-eyed Lizards play
Throughout the long bright summer-day—
Under the leaves in the gold sun-rain,
To and fro' they gleam and pass,
As the soft wind stirs the grass
A moment and then sleeps again.
And there, the noontides, dream the deer
Close couched, where with crests upcurled,
The fragrant ferns a forest rear
Within the outer forest-world.
And many a petalled star peeps through
The ferny brake, when breathe anew
The soft wind-pantings. And there too,
The hare and the tiny leveret
Betake them, and their fears forget—
Lazily watching with soft brown eye
The laden bees go sailing by,
With many a bright winged company
Of glitering forms that come and go,
Like twinkling waves in ceaseless flow,
Across those dreamy depths below.
And high above on the bending bough
Its gush of song unloosens now
Some forest-bird. Wild, clear, and free
Upswells the joyous melody
In proud, quick bursts; and then, anon,
In the odorous silence, one by one

The thick notes drop, but do not die;
For through the hush the soul keeps on
With a music of its own—
So runs the forest minstrelsy!
One other sound there soundeth only
Out of the distance dim and lonely;
Out of the pine-depths, murmuring ever,
Floweth the voice of the flowing river.

And we too, wend our way out of these pine-depths, following the windings of the flowing river, until we at length emerge and—what see we? Not the rocky rapids of our Canadian Severn, or the woody solitudes of Chief's Island, or the fringing "bush" that still skirts the shores of Lake Simcoe,—but an ancient home:

Beneath the shade
Of those old trees so bent and sere;
And there, with its stonework tracery,
The quaint old house, as old as they,
Still stood, and kept from year to year,
With storm and frost and slow decay,
A struggle for the mastery,

We are not then in Canada at all? Unless we have slept a sounder and longer nap than Rip Van Winkle: it would seem not. While we were imagining ourselves in the bush, and deceiving ourselves even to the fancying these hares and tiny leverets, were some native variety that haunted the Georgian Bay, we were all the time amid the glades and the associations of Old Europe. We could even fancy ourselves once more under " the huge, broad-breasted old oak tree," beneath which we first made the acquaintance of "the lovely lady Christabel;" for the rythm, and even something of the mode of thought, recall to us that most beautiful fragment of the dreamy Coleridge's muse. But it is Canadian poetry we are in search of, and we therefore leave the "Song of Charity," and betake ourselves to the additional poems which accompany it. And here, at length, is one of truly native name and characteristics: "A Canadian Summer's Night." Now, at least, we are not deceived. We glide over the rippling waters of Lake Couchiching, and list to its forest voices:

Still callest thou—thou Whip-poor-will!
When dipped the moon behind the hill,
I heard thee and I hear the still.

But mingled with thy plaintive cry
A wilder sound comes ebbing by,
Out of the pine-woods, solemnly.

And hark, again! It comes anew—
Piercing the dark pine-forest through,
With its long too-hoo, too-hoo!
* * * * * * *

Shoreward again we glide—and go
Where the sumach shadows flow
Across the purple calm below.

There the far-winding creeks among,
The frogs keep up, the summer long,
The murmurs of their soft night-song.

A song most soft and musical—
Like the lulled voice of distant fall,
Or winds that through the pine-tops call.

And where the dusky swamp lies dreaming,
Shines the fire-flies' fitful gleaming—
Through the cedars—dancing, streaming!

Who is it hideth up in a tree
Where all but the bats asleep should be,
And with the whistling mocketh me?

Such quaint, quick pipings—two-and-two;
Half a whistle, half a coo—
Ah, Mister Tree-Frog! gare-à-vous!

The owls on noisless wing gloom by,
Beware, lest one a glimpse espy
Of your grey coat and jewelled eye.

Now this is a genuine Canadian scene, such as no fire-side traveller or fancy-visioned poet of old world wanderings or library book-dust, could possibly call into being. The dark recesses of the pine-woods and the shadows of the lake-fringing sumach, the monotonous call of the Whip-poor-will, the soft and musical night-song of the frogs, the fitful gleaming of the fire-fly dancing in the cedar-swamp, the prowling night owl noiselessly listening to the mocking note—half a whistle and half a coo,—of the tree-frog: each one of these shows the touch of a Canadian pencil, such as the most labored study of the home poet would in vain attempt. In this direction alone lies the path in which poetic success is worth welcoming among us; unless indeed it be fancied that we can look for some great Canadian-born Miltonic epic, not local or exclusive, but for other ages and generations than our own, —of which consummation it can only be said there appears at present no very discernible prospect. D. W.

Climatology of the United States and of the temperate latitudes of the North American Continent, embracing a full comparison of these with the Climatology of the temperate latitudes of Europe and Asia, and especially in regard to agriculture, sanitary investigations, and engineering, with isothermal and rain charts for each season, the extreme months, and the year, including a summary of the statistics of meteorological observations in the United States, condensed from recent scientific and official publications: By LORIN BLODGET, Member of the National Institute, &c. Philadelphia, Lippincott & Co.; Trübner & Co., London, 1857.

In the prosecution of meteorological enquiries the United States deservedly hold a high rank. In the collection of meteorological data by fixed stations, as well as by surveying and exploring expeditions throughout the wide area of the union, an enlightened zeal has been ever manifested by the several public departments as well as by private individuals; and in contributions descriptive or explanatory of particular phenomena, the scientific literature of that country has been remarkably fertile. We are not, however, aware that prior to the publication of Mr. Blodget's book any attempt has been made to present to the world in a connected whole the large mass of materials which the industry of so many observers has called into being.

On this account if on no other Mr. Blodget, as pioneer in the work of compilation, merits the thanks of scientific men and of the world at large. His book bears marks of great acumen as well as of industry; it abounds in important facts and is highly suggestive, and as such well deserves to be recommended for a close and careful examination.

In saying this we do not engage to endorse every opinion entertained by the author. In a science so essentially progressive as meteorology many views must at best be held provisionally, subject that is, to be discarded or to be matured by extended observation. In Mr. Blodget's book we have a stem round which the fruits of future research may appropriately cluster, and glad shall we be if the work of grafting as well as that of pruning should fall to the lot of Mr. Blodget himself.

For the accomplishment of his task the author has brought experience of no common order: the aptness which he had exhibited for investigations of this kind procured for him some time ago the appointment of superintendent of the reduction of the meteorological observations made under the auspices of the Smithsonian Insti-

tution, in which capacity he was enabled to collect a large mass of data; and he has also apparently met with the utmost readiness on the part of the large body of observers throughout the continent to supply him with the results of their labors; so that as regards the temperate latitudes, to which his discussions are chiefly confined, there has been no dearth of materials.

The general arrangement of the book is clearly set forth in its ample title page:—it exhibits the geographical distribution of temperature and of the fall of rain and snow for the temperate regions of North America, it discusses the peculiarities of the two climatological areas into which the continent is divided by the Rocky Mountains, and draws a comparison between these and regions of analogous position in the old world. In conducting these comparisons regard is had to outline configuration, vertical elevation, and other physical features. The whole is illustrated by a series of neatly executed charts, consisting of an isothermal chart of North America for each of the four seasons, and one for the year, together with as many corresponding charts of rain and snow. There is also a temperature chart and a rain chart for the whole north temperate zone, with a profile of comparative altitudes for both hemispheres.

The book opens with an exhibition of the physical data upon which the author's subsequent discussions are based.

These data in the first place consist of the mean temperatures and the depths of rain at a large number of points both in the old and new world, arranged in tables for each month, the four seasons, and the year. In every case where it is practicable the latitudes and vertical elevations of the stations are given, together with the number of years from which the means are derived, and the actual dates at which the series commenced and terminated. For the old and new worlds the tables are arranged in separate groups. Besides the foregoing, for a few stations of importance in the United States at which observations have been continued during a long series of years, additional tables are given separately for each station, showing the monthly and annual mean temperatures, with the precipitation of rain and snow for each year that the period embraces.

Following the above mentioned and strictly meteorological details, which occupy the whole of the first chapter to the extent of about eighty pages, is a chapter on physical geography, which includes, in a tabular form, the vertical topography of the country east of the Rocky Mountains, arranged in belts perpendicular to the general direction of the Alleghanies. Another list for the regions west of

the Rocky Mountains is also given, arranged in meridional belts 5° in width from the 100th meridian westward.

In instituting a comparison between the old and new worlds, with respect to their physical geography, the author considers that there are features now sufficienly apparent in North America which hitherto have been considered as peculiar to the older continents.

"The great point of interest lies in the new features of our physical geography, or in the views which differ so far from those previously held, as to require a change in all deductions based upon surface and vertical configuration, as all those of climatology must be to some extent. The most important of these recent determinations is that of a much greater altitude for the western interior than was before assigned to it, and that high and arid plateaus and basins exist in nearly as great a proportion to the general area of the continent as in Asia and Europe. There are conditions of surface and configuration similar to those which have been thought peculiar to Europe and Asia belonging to great regions here, and we are to look for correspondence in climate, and in vegetable and animal life, and if this last does not now exist, we ascertain such a correspondence to be possible, and may adapt our practical interests accordingly. Guyot, and other writers on physical geography, have contrasted the temperate latitudes here with those of Europe and Asia, in the view that this is wanting in the high desert plateaus of these, and assuming for this less altitude, a greater proportion of plains, and, consequently, the analogies of sea climates in contrast with the extreme continental peculiarities of Asia. Our recent surveys have shewn that lofty plateaus, lofty mountains, and extended districts of the most extreme continental character, exist here in nearly the same relation to the whole mass of the continent as in the old world, and the comparison of the two thus becomes much more direct and more necessary than before, as essential to a proper understanding of our climatology. In short, we may compare the two as mainly equal and similar in the physical features of surface and configuration, and we must do so to correctly estimate the consequences upon climatology, which are always most directly dependent on physical geography." pp. 84, 85.

The Alleghanies have been often considered as forming a line of demarcation between two very different climatological areas: it would seem, however, from more recent investigations, that the elevation of these mountains has but little influence in interrupting the uniformity of climate, excepting in the moderate degree produced by altitude alone, and that it is the Rocky Mountains that we must regard as the true barrier between two regions climatologically distinct.

"The great chain of the Rocky Mountains is next in the surface configuration, and from this point forward all the uniformity belonging to the Eastern United States disappears, and the greatest and most abrupt contrasts occur. As in the north of India and in other parts of Asia, everything here depends on configuration and surface; and not only on these directly, but also on the relation of any point or locality to an extreme of configuration in the vicinity. Thus the valleys

of California are mainly controlled by the mountains near them, and if shut from the sea have arid climates, and, perhaps, a denuded, sandy, or alkaline surface; when if open to sea influences the reverse conditions prevail. These remarks apply more particularly to Oregon and the coasts north of the 35th parallel, than elsewhere, as the coast of Lower California is arid at all exposures." pp 88, 89.

This climatological division is again insisted on in the opening paragraph of the following chapter, descriptive of the general character of the Eastern United States.

"It is necessary to make a distinction of a very decided character between the parts of this continent separated by the Rocky Mountains, though the idea of this distinction has hardly yet entered into the received views of the North American climate. It is still described under the characteristics which belong only to the area east of the great plains, and the homogeneous character belonging to much of this great extent of surface is that recognized in Europe as the North American climate. Now that we have found this to differ so extremely from the interior and Pacific districts, it is necessary to describe it separately and to designate it as the eastern area of the United States.

So recently as the production of Guyot's able work on comparative physical Geography (Guyot's Earth and Man), the distinction made between the old world and the new was to assign to the new *oceanic*, and to the old world *continental* climates; the prevailing character of the Eastern States and the Mississippi Valley being taken as the type of the whole country. The great expanse of these plains gave reason for this distinction, in the then unknown condition of the interior and Pacific coast, but it is now clear that the proportion of arid and continental districts and climates is as great here as in the old world. The position of the plains exposed to oceanic influences is reversed, however, and instead of the extensive low areas belonging to the west of Europe our western coast is very narrow, and the Mississippi plain is, to some extent, the equivalent of the European plain.

But the climate of the Mississippi Valley or plain, and of the eastern side of the continent generally, is not oceanic strictly; and it differs radically from the oceanic climates of the west of Europe. It has its equivalent only in a similar continental position, or in China; which is, unfortunatly, too little known to aid the illustration much. As a whole, the North American continent differs little from the old world, except in the comparative areas embraced by the several divisions. Our oceanic districts on the west are very narrow and unimportant compared with the immense and fertile areas of like position and climate in Europe; our interior and extreme districts are differently placed from those of Asia, but in other respects they differ little; our eastern areas, which are properly neither interior nor oceanic, are comparatively larger and more important because of the existence here of a great interior plain opening southward to the tropical heat and moisture, and partaking to some extent of tropical peculiarities. . . . .

The early distinction between the Atlantic States and the Mississippi Valley has been quite dropped as the progress of observation has shewn them to be essentially the same, or to differ only in unimportant particulars. It is difficult to designate any important fact entitling them to separate classification; they are alike subject to great extremes and to the same extremes, they both have marked

continental features at some seasons, and decidedly tropical features at others, and these influence the whole district similarly, without showing any line of separation." pp. 125, 126.

One of the principal features alleged as belonging to this area, as a whole, is its adaptation to a great range of vegetable and animal life; another feature consists in this, that the whole area is in communication as regards its atmospheric changes: any agency that affects one point producing a corresponding though not necessarily a simultaneous, or equal, or even similar change throughout the area. In the words of the writer:

"As an associated feature of the uniformity just alluded to, the changes of temperature, and the oscillations of every sort, strike over the Eastern United States as changes would over any plane surface; that is they are symmetrical and uniform, and knowing what they are at a few places we may easily infer what they have been at all. Thus, if a degree of cold occurs at St. Louis on one day, and at Philadelphia two days afterwards, or at any interval whatever, we may be certain that the whole intervening district has been similarly affected. So of a barometric depression or variation, or of a great storm, or of particularly severe winds. Though the changes occurring in one part may not be felt at an opposite point,—as, though it may be twenty degrees below the average temperature for any period at Charleston, it may be as much above that mean at Albany or Montreal—the conditions, whatever they are, affect the intervening districts symmetrically, and are participated in at all places according to the distance from the extreme points. This may be the case to some extent in other climates, or it may be so with some of the great changes, but here it is characteristic of all, and it contrasts extremely with the abrupt transitions, and the predominance of local changes in Southern and Central Europe, and on the west side of this continent as far as known." p. 129.

This chapter abounds in matter for reflection, but as somewhat copious extracts have been already made from it, we must commend it to the study of those specially interested in the subject, and content ourselves by quoting one more passage in which the general type of a storm is described. The description we leave to the experience, or to the future observation of our readers, to verify.

"Beginning at the northwest, or near Fort Snelling, the general succession of phenomena in the change from calm, average conditions, to the restoration of such conditions again, is something near the following: first, an increase of temperature with winds from the south, south-west or south-east, of duration proportioned to the measure of the change that is to occur, or of from one to four or five days; a fall of barometer; a rain with east, north-east, or south-east winds during the first half of its duration; a sudden change of wind to some westerly point with a rapid reduction of temperature, high winds and a rising barometer; and, in conclusion, a period of comparatively cold and clear weather. The nucleus or central area of this phenomenon, regarding it as a whole, or, as it may be done for illustration as

a moving body, usually progresses eastward at the rate of three hundred miles in twenty four hours; and it is quite usually attended by a similar succession of changes until it reaches the Atlantic coast." p. 181.

Passing on to the west of the Rocky Mountains, we find one of the leading characteristics to be that of intense aridity. In illustration of this the temperature of evaporation, or that indicated by a wet bulb thermometer, will frequently remain for several days together 20° below the temperature of the air. At the driest part of the day this difference will sometimes amount even to 25° or 30°, and will continue for several months without falling short of 20°.

A remarkable effect of this dryness is the long resistance which animal substances offer to putrefaction, by which travellers are enabled to carry meat for almost an unlimited time without using salt or any preparative process.

Another remarkable feature in the Pacific climate is the extraordinary daily range of temperature, compared with that prevailing elsewhere, that sometimes takes place. Officers engaged in surveying have reported noon-day temperatures of 87° and 92°, followed at night by a depression below the freezing point, and in one locality a mean daily range during a fortnight of 55°. These extremes are doubtless chiefly due to the extreme clearness of the atmosphere, which its dryness produces, and which facilitates the absorption of heat by day and its loss by night.

The remarks on the Pacific climate are thus summed up:

"In review of the distinctions of a general character belonging to the interior and Pacific climates, they may be briefly stated to be *aridity* first; isolation of districts and conditions next; and periodicity of rains, winds, and some other leading phenomena in distinction from *equally distributed* rains, &c., as in the Eastern United States. The isolation of phenomena implies an interruption of the symmetry so characteristic of the East, and all the important differences which follow in this train. Extreme contrasts, diversities, and transitions belong here to *place* or *locality*, and in the East to *time*." p. 164.

Space will not admit of the introduction here of further extracts; we must be content, therefore, with indicating—as portions of the book peculiarly adapted to interest the general reader—the chapter on winter storms, and the succeeding chapters on climate considered in reference to vegetable productions, and in its sanitary relations. Compelled, however, to bring this notice to a conclusion, we would regret indeed were our intercourse with the volume itself to terminate

with equal abruptness. We have found our estimation of it increase as we acquired a more familiar acquaintance with its contents, and with this commendation we now leave its further study to our readers. G. T. K.

The Canada Directory, for 1857-58. Montreal: John Lovell, 1857.

In all ordinary conditions of the studious mind, it must be confessed that a Directory or an Almanac, ranks along with Dictionaries, Concordances, Cookery books, University Calendars, Library Catalogues, Law Lists, Old Bailey Registers, and the like highly useful compilations: as a species of reading by no means too seductive or fascinating. Waylaid in a country inn on a rainy day, for lack of better, we have resorted to such reading, where choice was small; and the associations of the book seem to chime in very harmoniously with our recollections of the dreafy drizzle, and dull monotonous plash from the dripping eaves. Here, however, comes before our editorial eye, a portly and well-conditioned volume, and—spite of all memories of such association with older members of the same worthy but prosaic family,—insists on its merits, claims to be permitted an audience, and asserts rights that will not be gainsayed.

And for a member of the aforesaid family, it must be owned that the Canadian Directory of 1857, has a wonderfully prepossessing manner and appearance. Nor, on closer acquaintance, does it prove by any means of so dull and commonplace a character as our enforced intercourse with some of the elder race of Directories had led us to anticipate; but on the contrary it is full of information of a highly varied and useful kind; and, albeit, like all its kith and kin, of an essentially practical turn in the main, it does not even refuse a little convenient by-play of sarcastic humour at a time.

The idea ordinarily attached to a Directory is one of those very convenient but ephemeral lists of names and addresses which lie on the desk of the Coumting house for the year, and are then consigned to the waste-basket as worthless, except for the paper on which they are printed. Such, however, involves a very inadequate conception of this handsome and bulky imperial octavo. It does, indeed, embody such an index to places of business and private residences throughout the province; and, assuming the accuracy, which we find on testing these by a few known references, to be general throughout, this depart-

ment alone must have involved an amount of labour and expense which it is difficult to perceive how the small price of so large a volume can repay. But besides this, and the Canadian and States advertisements, —which would almost require an appendix already, to intimate what effect the recent commercial crisis and American National bankruptcy have had upon them,—the statement in the preface is fully borne out, that, in addition to its value for the man of business, it is no exaggeration to say, it is "a Guide-book for the man of pleasure, an Index for the immigrant, and an Instructor for the settler; a Gazeteer for the student, and an Army-list for the militia officer; while for the statesman and others connected with official life, it is a Statistical Chronicle of the progress of the country in all departments of enterprise."

The Canada Directory is announced as a periodical intended to be continued each alternate year; and as the time approaches when this goodly octavo shall be deposed from its desk-throne, to make way for its successor, we can fancy the gathering doubts with which reference will be made to its already antiquated pages; until at length we witness the ungracious heartiness of its deposition: turned out of its responsible post of honor as unceremoniously as Paris's old citizen-king of 1848, was hustled into his hackney cab, and bundled out of the kingdom—kingdom no more—like so much shot rubbish.

But there are other things besides good wine which improve with the keeping, and develope undreamt of virtues in the sober maturity of their years. We have often conned over, in by-gone days, the thin little duodecimo Directories of the antiquated Edinburgh of the 18th century, compiled by the once famous Peter Williamson, who, after spending his earlier years among the Indians of our North American wilds, carried back some of the Yankee enterprise with him, and set up a house of entertainment for the legal hangers-on of the Scottish Parliament House, designating himself somewhat mysteriously "Peter Williamson, from the other world!" There he established the earliest "penny post," or receiving local letter box for the General Post Office; and there too he was the first to publish a street Directory for the Scottish Metropolis: which the curious still ransack—not in vain,—for evidence of the local habitation of Johnson's Bozzy, and many another local and world-famous celebrity of Auld Reekie. It is to this Scottish John Lovell of the eighteenth century, that the poet, Fergusson, thus alludes, in his "Rising of the Session;" *i.e.* the close of the Scottish legal term:—

> This vacance is a heavy doom
> On Indian Peter's coffee-room,

For a' his china pigs are toom;
Nor do we see
In wine the soukar biskets soom
As light's a flee.

Old Directories are, in truth, a favorite and much valued resort for the topographer, the local antiquary, and the curious biographer. Professor Masson, for example,—sifting out the scattered fragments of incidents and surmises relative to the brief career of "the marvellous boy,"—remarks: "In what precise part of Shoreditch that house of Mr. Walmsley was where Chatterton lodged when he first came to London, and to which, on that memorable day, he returned through many dark and strange streets, we do not know. London Directories of the year 1770 are not things easy to be found." And Peter Cunningham—more successful in his search after, and into the old Directories of the "Fog Babel,"—fishes up many a hint from thence to give graphic individuality to the Sketches in his "Handbook of London." And Canada too has her men already, we trust, about whom future topographers and biographers may have something to inquire; and has her elements of wider, and ever widening interest, about which the future historian will have many anxious questions to ask. The immediate use, and aparently all the value of Mr. Lovell's labours past, on the superseding of this Directory by its successor of '59–60; the obsolete columns of names and addresses, with business and banking records, local officialities, advertisements, and so forth, will seem stale and worthless, and, "dry, as the remainder biscuit after a voyage." Nevertheless, stored away on the shelves of public and private libraries, the time will come when—in the few antiquated survivors of the present large and plentiful edition,—all this classified miscellaneous matter about Clergy and religious denominations; Universities, Colleges, and Schools; Periodicals, and the Canadian press; Banks, Customs, Crown Lands, and Railways; Trade, Emigration, Population, and general statistics; shall prove to be possessed of the very highest value. Some, indeed, of what seems most local and ephemeral in its character will, by and by, grow to be the most curious and widely interesting of its contents, and gather cobwebs of as eloquent antiquity as ever draperied ancient wine bin, or world-famous Heidelberg tun. The quaint gossip of Old Sam. Pepys is not quainter than much of this will yet be. We have only to fancy the possibility of getting hold of such a volume compiled by some enterprising Juan Lovell, Spanish hidalgo of the sixteenth century; or by one of Raleigh's colonists of the Virgin Queen Bess's era; or a prim and dumpy New England

quarto, as well stocked with clerical and lay statistics, advertisements, and judicial details, in the time of Increase Mather and the New England-witch trials. What a treasure would the volume prove to the Antiquary and Historian. How would the Historical Societies of Salem, New Haven, Boston, and Nantucket, contend for the honor of reprinting the precious document. What jealousies, and rivalries, and boastful eurekas would there be? Yet, doubt it not good reader the days of our own Queen Victoria will come to be as ancient, and quaint, and full of curious mystery to other generations, as ever were, or will be, those of a Castilian Isabella, or an English Queen Bess; and this portly volume has only to be kept long enough, to look as strange and antique to the men of another century, as ever a dumpy, brass-clasped quarto of the old puritan days of New England. When the Canada of Anno Domini 2058 looks back, with inquisitive wonder, on the Green-Youth of its nineteenth century, what a singular melange will these Directory advertisements then appear, which now present to our familiar eyes so business like an air. How will the antiquarian book-worm of that unborn century gloat over the mysteries of these so matter-of-fact trading manifestos and pictorial devices. And yet, there is also an aspect scarcely less strange and note-worthy, in the reproduction amid our new Canadian clearings of so much that pertains to an old-world civilization, and luxurious ingenuity of extravagance. Amusing it is, indeed, to find here just such another inventory, begot by the new-born energies of young Canada, as took the fancy of the poet of the "Task" in the Old England of the eighteenth century, with its broad-sheet wilderness of strange but gay confusion:

Roses for the cheeks,
And lilies for the brows of faded age;
Teeth for the toothless, ringlets for the bald,
Heaven, earth, and ocean, plundered of their sweets,
Nectareous essences, Olympian dews,
Sermons, and city feasts, and favorite airs,
Eethereal journeys, submarine exploits,
And Katerfelto, with his hair on end
At his own wonders, wondering for his bread.

Truly there is nothing new under the sun; and yet one might fall upon much duller and less novel reading than some of these same advertisements, set forth here in all the glories of fancy typography and illustration, to show our Great Grandfathers and Great Grandmothers how we lived in the reign of good Queen Victoria. Here for example, —set forth by a graphic and most moving picture of an unfortunate

fair lady in the transitional stage of rejuvenescence, with her locks on one side white as snow, and on the other rivaling Milton's "raven down of darkness,"—is a manifesto of THE GREAT AMERICAN HAIR TONIC and HEBEAIONA, or *Balm of Cytheria,* which was proven at the late Boston Mechanics' Fair, on the authority of Dr. Hayes the eminent *State Assayer,* "over the choicest hair dyes of the Union, to be the best in the world. It permeates to the cellular tissue of the cuticle, and forces the Hair and Moustaches to grow. It cures"—but we have not space for its many virtues. It manifestly would be fatal to any lady's womanhood should it touch her chin; and a very small pot of it may be warranted quite equal to the largest quantum of Bear's Grease, for converting a common deal box into the most comfortable of hair trunks. Other equally gratifying evidences of the world's progress set forth "*Professor Wood's* Hair Restorative: To maiden beauty it is the finishing touch; to manhood it is the symbol and warrant of strength and nobility, to day, as in the days of the Patriarchs," &c. Or, if possible to reach a perukerian climax, we have the new *Comacantothermonigria,* or celebrated Bachelor's Hair Dye. "Its celebrity has reached the whole circumference of the globe; every country where civilization exists have patronised this surpassingly excellent hair dye. Its practical application upon over two hundred thousand persons, the Diplomas, &c., attest the fact that the superiority of this dye can never be lessened. Observe the hundreds of Dyes, so called, put forth to rival this grand original—note the ridiculous dilemmas they lead the unfortunates into who use them; The Rainbow Tints, the Blisters, the Fits, the . . . ," &c.! &c.!! &c.!!!

The novelties of drinking advertisements again furnish a highly moral index of the Maine liquor law reform. One benevolent New York dealer has provided himself with a stock of wines of the most healing and medicinal character. Another, a Druggist of Boston, disposes of his fine old Whiskey "expressly for medicinal purposes;" and here again that useful public functionary the State Assayer, certifies the peculiar aptitude of the said Whiskey *for medicinal use.* It is accordingly put up in boxes, each containing one dozen quart bottles, for the convenience of delicate invalids.

Tobacco has its virtues set forth in all the eloquence of fancy type, and from one New York agency we learn the somewhat note-worthy information that he has "constantly on hand Tobaccos suited for the British provinces;" so that it would seem we have our own nicotian specialities, whatever these may be.

Literature again, plays—as becomes this highly enlightened age,—

a very prominent part. One eloquent bibliopole certifies of his publications, that "they cover every branch of human knowledge, from the child's A B C to the highest classical and scientific manual in Universities." But this is nothing to the Broadway Publisher who advertises a *Family Library* which would seem to be a new and infinitely more universal *Principia*. It treats of:

"The Divine Origin of Families, and of their relations to Christ and the Church; the noble and generous, as well as tender emotions associated with marriage; the sympathies of the home-circle; domestic happiness; the parental and particularly the maternal relation; family cares, trials, and vicissitudes; the principles of courtesy; family order and discipline; education of children; elegant accomplishments; fireside amusements and recreations; domestic virtues on Gospel principles; home made happy; housekeeping; cookery; carving; health, and the philosophy of living; sight and hearing, how preserved and lost; the use and beauty of the teeth; care of the sick; family bereavements; and Christian monuments to the memory of the deceased."

A Boston Publisher, who sets forth the virtues of his store, and advertises "The Moral Philosophy of Courtship and Marriage," and other "most valuable books for all ages, and both sexes," informs us of the following highly spiced product of Judicial literary recreation, penned in the cause of public morals among the descendants of the Puritan Pilgrims:

"The popular author, Judge Thompson, has just completed, for the public eye, the Great Work of his Life, entitled GAUT GURLEY, OR THE TRAPPERS OF LAKE UMBAGOG. This exciting tale is founded on a murder of unusual atrocity, that occurred about forty years ago. Gaut Gurley was supposed to be an actor in this and other flagitious crimes, and made his escape to the West Indies. Judge Thompson has built a Story upon these historic facts, which will probably be more read by New England people than any book which he has ever written. It is a work of thrilling interest and rare power."

So much for Literature. Nor is Science overlooked. There are indeed *cork legs* and *arms*, so scientifically perfect, that the wonder is any body continues to wear their natural ones: the Anglesey leg, for example, quite an aristocratic substitute for any common-place plebeian limb, and worthy to rank with the world-renowned one of Miss Kilmanseg. "The Marquis of Anglesey, (from which it derives its name,) found none equal to it, and wore it from the time he lost his *Leg* at the Battle of Waterloo till his death, in preference to all others. It has been tested in every possible way by all classes, male and female, and improvements added until it has attained its present perfection, and certificates can be shewn from numbers who are wearing pairs!" But to get from the feet to the head and crowning seat of Science; a tempt-

ing page allures to a wholesome self-examination, under the appropriate motto: "The proper study of Mankind is man." A cranium and physiognomy of Grecian perfection is pictorially mapped out as a phrenological chart. Towards the region of the lambdoidal suture we perceive a cerebral organ which produces on the retina the sensational idea of a gentleman making a graceful bow to a lady, and on referring to the corresponding number in the inventory below, we find that this spot is the seat of an intellectual organ, known, it would seem, as *Approbativeness.* Next, passing over a very touching representation of Friendship, we come to one marked (A) which, as it appears, is "*Conjugal Love*, or *the pairing instinct*;" while, in odd proximity, immediately alongside of it, a highly pugnacious scene of fisty-cuffs points out the region of *Combativeness.* The mental science has grown wonderfully since Lord Jeffery came into collision with Comb and Gall, and Spurzheim. Here we stumble over such psycological novelties as *Continuity, Vitativeness, Alimentativeness, Sublimity, Spirituality, Suavity,* and—oddest of all—*Human Nature*: whatever that may chance to mean as a mental faculty! We used to be of opinion that Phrenology had at least contributed some convenient terms for the use of the Mental Philosopher, whatever else might be set forth as its claims, but it would seem to have been indulging of late in transcendental flights, far beyond the reach of ordinary and uninitiated mortals.

Finally, we must by no means overlook the perfection to which the SCIENCE OF ADVERTISING has itself here attained. The glories of fancy typography; the æsthetics of pictorial hierography; the emphatic *Italics*; the lanky, dumpy, and excentric *Sand-letters*; the *Script*, the *Great Primer*, the *Pica*, the *Bourgeois*, the *Minion*, and *Nonpareil*; with all the thousand arts of the compositor, are the mere frame-work of this Science of puffery. Some of the specimens already quoted may serve as samples. But unfortunately, like all other good things in this wicked world, it is liable to abuse. One benevolent N. Y. Philantrophist, who has devoted "years of study and labor to the discovery and preparation of the *Gum-coated Forest Pill,* to meet the wants of suffering humanity," feelingly deplores the baseness of "unprincipled men who issue bogus spurious articles under the same name, to deceive the public." It is pleasant, however, to learn that "these vile attempts to impose on a discerning public seldom met with success; while such as innocently became the victims of Bogus imitations no sooner attempted to sell it than, to their disgrace, it was at once returned to them." Nevertheless, the benevolent advertiser, as a simple duty he owes to mankind, warns the public, if it would not be taken

in with a Bogus Bolus, to "examine the label and purchase of men of integrity!" As will be observed in sundry examples quoted above, there is a pleasant indifference to the relations ordinarily supposed to subsist between grammatical nominatives and verbs, which frequently adds a novel and exceedingly striking effect to these highly seasoned specimens of our own nineteenth century commercial literature. Had we not indeed, already exhausted our available space, we could select specimens of "Canadian" and "American English," such as we can suppose some future Trench, or Latham, or Guest, puzzling his critical brains over, in the bewildering effort to invent the Grammatical rule which shall embrace an authority so high and indisputable. But we leave the further investigation of the subject to the enterprising reader, who will find a whole library of truth and fiction, fact and fancy, embraced within the ample boards of Lovell's Canadian Directory, and extending through one thousand five hundred and forty-four pages of as varied typography as his eye is ever likely to travel over.

To such glimpses of this New World of ours, in the year of Grace 1857, we can fancy the curious descendant of our Canadian generation, turning with no little wonder, in that coming century we have ventured to look forward to. If, however, any Map survives to tell him of the localities to which the various advertising sheets pertain, he will probably have penetration enough to perceive that the science of advertising in all its superlative magnificence, pertained to the Union Cities South of the Lakes; and that our Canadian enterprise confined its utterances, for the most part, to a much more homely and sober style in setting forth the virtues of its wares, being actuated possibly by the somewhat antiquated aim of—being believed.

D. W.

Annual Report of the Board of Regents of the Smithsonian Institution, showing the operations, expenditures, and condition of the Institution, for the year 1856, *and the proceedings of the Board up to January* 28*th,* 1857. Washington: Cornelius Wandell, Printer. 1857. 34th Congress, 3rd Session. House of Representatives. Mis. Doc. No. 55.

The progress of the Smithsonian Institution at Washington cannot fail to be watched with jealous interest by Scientific men, and especially by the countrymen of the founder, to whom it might be

permitted to regret that misunderstandings on one side and pique on the other had suffered so splendid an endowment to pass from its natural course into a foreign channel. The funds left by will of Mr. Smithson, (an Englishman, and an illegitimate son of the Duke of Northumberland,) who had quarrelled with the Royal Society after having offered the endowment to them, amounted to over five hundred thousand dollars, and were accepted by the Government of the United States, in trust, "to found at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men." Considering the fate which has befallen too many of the charitable bequests in the old world, it was an interesting question to find how such a trust would be executed in a case where no superior tribunal could exist to take cognisance of malversation, and where lack of specific definition in the wording of the bequest left plausible openings for misappropriation, the only protection against which, was the honor of a government whose citizens have not been uniformly notorious for the best of faith towards creditors. When the Act of Incorporation was before Congress, it was perhaps natural that such schemes as the following should be suggested: the diffusion of popular information among the people of the United States by the distribution of Tracts—the foundation of a National University—the establishment of a large library at Washington, or of a National Museum. Of these, the first is simply ridiculous, and against the rest it was urged by some who, fortunately, took a wider and juster view of their duties as trustees in the management of this endowment, that the object designed by the founder was specific as regards the "increase of knowledge," and cosmopolitan as regards its "diffusion among men;" that it was clearly never intended by him merely to educate the youth of the United States, nor to found monster establishments of books or specimens in a particular locality, which could only benefit citizens of the United States, and but few even of them. There was plain justice in this reasoning, for, however desirable and laudable these designs may be in themselves, they are only indirectly related to the design of the endowment; would have been in their effects chiefly and primarily beneficial to the country in which they existed; and ought, if their existence is desired, to be provided for by that country itself. If institutions which shall rival the British Museum, the National Gallery, and the Universities of Great Britain are to exist on this side the Atlantic, they should be raised by the people whose advantage and glory they concern, and not by the legacy of a stranger

who desired to found (in the paraphrase of Professor Henry) "an institution to promote the discovery of new truths, and the diffusion of them to every part of the civilized world." Happily these views prevailed to some extent in Congress, and the result was a compromise whereby large discretion was left to the Board of Regents, although they were enjoined to establish museums of natural history, geology, and mineralogy; a chemical laboratory, a library, and a gallery of art; also, to have lectures delivered, and a suitable building for these purposes provided. In accordance with these instructions, the Regents at first determined to divide equally the annual income between the carrying out of the designs thus specified, and other plans which they considered more agreeable to the proper functions of the institution; they were also able, while complying with the letter of the Act of Congress in these respects, to render the accomplishment of the forenamed designs more in accordance with the spirit of the founder, and thus diminish the evils resulting from this imperfect legislation. The Library was made chiefly to consist of the transactions of the various learned societies; the collections for the Museum were made by the parties of the United States Survey; the Laboratory and Apparatus were furnished in a judicious spirit of practicalness, and made to include a Magnetic Observatory; and the Lectures (the most objectionable feature of the plan) have also been the least expensive. Still later the Regents repealed the system of equal division, and the funds are now appropriatod as seems to them best from time to time; in this conduct, it is creditable to Congress that they have been sustained, though a strong agitation was raised against them. Of the justice of this course, we, as foreigners, can entertain no doubt, and still less when we find such passages as the following in the Secretary's report:—" The expense of this part, however, of the operations of the library is small in comparison with that which is in reality of little importance. I allude to the cost of keeping up a reading-room, in which the light publications of the day, obtained through the copy-right law, are perused principally by young persons. Although the law requiring a copy of each book for which a copy-right is granted, to be deposited in the library, was intended to benefit the Institution, and would do so were it designed to establish a general miscellaneous collection, yet as this is not the case, and as some of the principal publishers do not regard the law, the enactment has proved an injury rather than a benefit. The articles received are principally elementary school manuals and the ephemeral productions of the teeming press, including labels for patent medicines,

perfumery, and sheets of popular music. The cost of postage, clerk hire, certificates, shelf-room, &c., of these, far exceeds the value of the good works received. Indeed, all the books published in the United States, which might be required for the Library, could have been purchased for one-tenth of what has been expended on those obtained by the copy-right law. . . . . . . Included in the additions to the museum during the last few years from Government exploring parties and private individuals, have been a number of living animals. Among these were two bald eagles, an antelope, monkeys, raccoons, two wild cats, a jaguar, and a large grizzly bear, the latter from the Rocky Mountains. . . . . It is neither compatible with the means of the Institution nor the duties of the Secretary and his assistants to take the custody of specimens of this character. While such presents evince kind feelings, and are complimentary to the management of the Institution, the expenses of transportation have been in some cases rather a heavy tax, and while we cannot very well refuse donations of this character, they would be much more acceptable were they received free of cost. . . . .
The adverse effects of the early and consequently imperfect legislation ought as far as possible to be obviated, and this could readily be done if Congress would relieve the Institution from the care of a large collection of specimens, principally belonging to the Government, and purchase the building to be used as a depository of all the objects of natural history and the fine arts belonging to the nation. If this were done, a few rooms would be sufficient for transacting the business of the Institution, and a larger portion would be free to be applied to the more immediate objects of the bequest. Indeed, it would be a gain to science could the Institution give away the building for no other consideration than that of being relieved from the costly charge of the collections."

The remaining or extra-congressional part of the plan adopted by the Regents, and that to which we may assume the main efforts of the Institution will in future be devoted, consists of the following details, having in view (1) the increase of knowledge, (2) its diffusion among men.

For the first, it is designed to "stimulate men of talent to make original researches, by offering suitable rewards for memoirs containing new truths," and "to appropriate annually a portion of the income for particular researches, under the direction of suitable persons." When we reflect on the immense success which has attended similar measures in the French Academy, the Royal and other

societies, and the British Association, we cannot doubt the wisdom and foresight displayed in these regulations, and may already congratulate the Institution on the prosperous results of the former part of their design, as evinced by the valuable memoirs which have appeared from time to time in the nine volumes known as the Smithsonian Contributions to Knowledge: the latter part will no doubt in due time be more fully carried out than seems yet to have been done, although the system of meteorological observation inaugurated by the Institution is no mean effort.

The second part of the design, for the diffusion of knowledge among men, it is intended to promote by "the publication of a series of reports, giving an account of the new discoveries in science, and of the changes made from year to year in all branches of knowledge not strictly professional," and, "by the publication of separate treatises on subjects of general interest." At present this portion of the plan has been very partially put into execution, yet we do not know of any want which is more pressingly felt than some such method of making accessible at once to the cultivators of science every where the discoveries which are now being so rapidly made in almost all departments. Much has been effected by the excellent reports issued from time to time by the British Association; but it would be an inestimable boon if the contributions to knowledge now scattered through isolated and often inaccessible periodicals, or lost in the crowded transactions of sparse societies, were year by year collected and arranged in a form which would enable each detached workman to see how far the building for which he may be hewing stones is rising by other hands. Nothing is more striking and distressing in the history of science than to see the waste of labor and intellect, and the disputes and heartburnings that have been caused simply by ignorance of what has been simultaneously doing in other places. It is true that to carry out this proposal efficiently would require a larger staff than seems to be contemplated in the Institution: but perhaps this very circumstance makes in its favor, as thus affording a provision (somewhat analagous to many examples in the old world, and in which the United States are lamentably deficient,) for maintaining a class of men who would make science their sole pursuit, and who would cultivate knowledge for its own sake and not as merely manure for the dollar tree. Certainly it would seem that the funds might be more properly devoted for such a staff than for that necessary to furnish the store clerks of Washington with rail-car iterature, or even than to illuminate the city belles by the light

of popular lecturing. However, when we consider that the Institution is yet in its infancy, having barely existed for ten years, and contemplate what has already been effected by it, we are justified in hoping brightly for its future progress; and we would here record our grateful sense of the exertions of its noble Secretary, Professor Joseph Henry, to whom mainly all these results are due. He has fought the battle almost single-handed on behalf of science against narrow nationalism and political greed; he has met with obloquy and persecution, but may now look back with pride on the work he has done, and forward with hope on that which is before him, secure that he possesses the sympathy and gratitude of his brethren in science, whose interest he has so well served while at the same time saving the honor of his country.

We may briefly mention that the total amount of the bequest received into the Treasury of the United States was $515,169; of the interest that accumulated on this before the Institution went into operation, a portion amounting to $325,000 was devoted to building purposes, and the remainder of about $125,000 has been added to the principal, so that the annual revenue is now about $40,000, of which nearly the whole is expended in the manner above described.

The title at the head of this article is that of the Tenth Annual Report of the Regents to Congress, containing, in addition to the business matter of the Institution, an appendix, the contents of which are of a varied but generally useful character. Among these we may notice an abstract of lectures on architecture in connection with ventilation, &c., by Dr. Reid, whose disputes with the architect of the New Houses of Parliament will be familiar to all the readers of *Punch*. Professor Henry's very excellent article on "Acoustics applied to public buildings," (already given in this Journal, Vol. II. page 130,) and his report on the testing of building materials, are here: there is also by the same gentleman a syllabus of a course of lectures on Physics, which, starting from the ultimate properties of matter, carries us forward through the whole range of Natural Philosophy along a track which, although well laid out, seems to us less truly philosophical and less in accordance with the history of science than the one pursued by Comte. There is also a proposition for a work by the illustrious author of the ninth Bridgewater treatise, the magnitude of which is of startling dimensions: its suggested title is "The Constants of Nature and Art," and, in the words of the proposer, it "ought to contain all those facts which can be expressed by numbers, in the various sciences and arts." We are glad to observe

a detailed account of the Observatory at St. Martin's, erected and maintained by our esteemed contributor, Dr. Smallwood, of whom Canada may be proud, and to whose zeal and services a graceful recognition is here awarded. The translation of Muller's "Report on recent progress in Physics," commenced in the last report, is here continued by a different hand and, we are glad to say, executed in a much better style; the paper itself is a most valuable one, and the Regents have done well in selecting it for publication. On the whole the present volume will not be found less valuable than the best of its predecessors, and we trust it may be followed by many which will rival it in usefulness.

J. B. C.

The Geography and History of British America, and of the other Colonies of the Empire; to which is added a sketch of the various Indian tribes of Canada, and brief biographical notices of eminent persons connected with the history of Canada. By J. George Hodgins. Toronto: Maclear & Co., 1857.

We welcome, with sincere satisfaction, this useful little product of the Canadian Educational Press, as an attempt—and in most respects a very successful one—to supply a grave defect in the materiel for juvenile school training. We have already* commented on the highly objectionable character of some of the most popular American Geographies and Historical Manuals as British or Canadian School Books. We have no desire that the rising generation should be taught, in American fashion, to decry every other nation, and esteem themselves the greatest, wisest, mightiest, and most superlatively progressive people that the universe can boast of. Nevertheless we do think it becomes us as members of the British Empire to know a little of its Geography and History; and as Canadians to acquire our information from some less partial source than "Morse's Geography," and the like products of the American press, which still hold their place in so many of our schools, and devote more space to setting forth the glories of some single States of the Union than they can spare for all Britain and the Canadas together.

Mr. Hodgins' Colonial History and Geography will meet, at once,

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* *Ante* Vol. I., page 465.

one of the most obvious wants of our Scholastic system; and issued, as we may presume it to be, under the authority, or at least with the approbation of the Chief Superintendent of Public Instruction, we may anticipate its general adoption throughout the Common Schools of the Province. Should such be the case a new edition must soon be required; and this will afford the author an opportunity, which we trust he will avail himself of, to make a careful revision of the text, and remove from it sundry evidences of haste in the original composition, as well as of carelessness in the press-reading.

In case of such a revision, other amendments may probably occur to the author. We very much question, for example, the fitness or good taste of introducing into a school-book biographical sketches of living celebrities,—political and ecclesiastical,—some of whose names are still bandied about in our daily press, and associated with sectarian or party cries. That is not a direction in which we have any reason to apprehend a want of instruction for the rising generation. We can scarcely anticipate satisfactory results from such "school exercises" as the following:—"Give a sketch of the career of Sir Allan MacNab," or "The Hon. M. S. Bidwell," or "Sketch the Career of the Hon. Francis Hincks." These and other names introduced here are still the shibboleths of party politics; and some of them, at least, are destined to be forgot as soon as they cease to be so. They must be as unacceptable to many parents' ears as they may be welcome to others. To sketch the career of living politicians is a new demand on the class form.

The sketch of the Indian tribes of Canada is concise, and, on the whole, comprehensive in its brevity. On one or two points, however, it would be benefitted by revision. In the matter of Indian names, especially, we think the affected purism, which aims at a return to the aboriginal etymon, peculiarly out of place in a school-book. Now that the name *Ottawa*, for example, is fixed in the termonology of our Canadian geography, it can only lead to confusion to perpetuate such terms as Utawas, Atawawas, Odahwas, &c. Again, we have *Odjibwas* and *Wyandots*: the least familiar forms of the names of tribes, one of which still embraces the most numerous of our Upper Canadian Aborigines, while the other has bequeathed its more familiar designation to Lake Huron. The accuracy which aims at including all the diverse terms, and every variation of such names, as the student may chance to meet with in minute research, is worse than useless when presented to the indiscriminating and unretentive memory of a child. Let him learn first to associate all his ideas on the subject with one

definite, and if possible, simple and easily remembered name, and by and by all the rest will follow without labour or difficulty. To tell the child at starting that the Huron Indian is also the Wy-an-dot and the Qa-to-ghie; and that the Chippewa is the Od-jib-wa, the O-jib-way, the Chep-e-wy-an, and the Chip-pe-way, may possibly disgust him with the whole subject: it certainly can not render it any clearer to his mind. For nearly similar reasons we conceive that the space devoted to the derivation and significance of Indian topographical nomenclature might be much more usefully employed. Some of the interpretations are certainly wrong, others of them are open to grave doubts; while the important element, dependent on the essential differences of the Indian languages from which they are derived, is entirely overlooked. Such philological studies, even if correct, are premature, in such a rudimentary work as this. As we are suggesting amendments, we may also recommend the summary ejecting from the otherwise appropriate conclusion, that everlasting "Morning Drum" of the Honorable Daniel Webster, which, however "beautiful and impressive" when first heard, begins to grow somewhat wearysome from the hard duty it is made to do in Canadian oratory: "following the sun, and keeping company with the hours, with one continuous and unbroken strain" of trite grandiloquence.

We would not, however, wish to dwell on the partial blemishes of a book which we hope to see, not only re-issued in a form altogether satisfactory and acceptable as a most welcome addition to our school literature; but also made the model for a larger and more comprehensive work suited for advanced students, and designed to leave a more detailed and consequently a more permanent impression on the mind. In such a work, though Canada may still claim the largest share, it will not occupy it quite so much to the exclusion of other colonies and possessions of the British crown. Were geography the sole object in view, it would perhaps be legitimate enough to club Gibraltar with Heligoland, the Isle of Man, and the Channel Islands, in the minute segment of a concluding page here allotted to the whole; but for a work bearing on its title page "The Geography and History of the Empire," these themes are rich in historic associations demanding a much larger space. So also with British India, Ceylon, The Cape, St. Helena, and Malta, as well as other British dependencies, it would be difficult to conceive of subjects more suggestive of useful and attractive study for the beginner, just entering on the threshold of historical investigation. We deprecate, above all things, the infusion into the youthful minds of our provincial students of a

disproportionate and untruthful estimation of Canada. Such a proce ss of learning history has as much utility and beauty in it as the study of oneself in a convex mirror, where the nose swells to a size that rivals the remainder of the distorted features, and the face itself outbulks the whole dwindled and tapering figure. Canada is *not* the greatest corner of the universe, nor Toronto the concentration of all that is sublime and exclusively select and magnificent on our little planet. And as it is generally thought desirable that our young common-school pupils should have some idea that this Earth of ours is not quite so big as the Sun, and may even compare disparagingly with Jupiter or Saturn: we have an idea that there may be nothing unwise or unpatriotic in giving them equally truthful ideas of the political world at large; instead of merely substituting a Canadian "Morse" for the American one, which illustrates the Geography of Ireland by the picture of a "Peeler distraining for rent;" and after expending some forty pages on its own glorious "United States," generously spares a single page and a fraction for the whole of British North America. Regarding as we do such teaching as peculiarly injurious to the minds of the rising generation, we congratulate Mr. Hodgins on setting the example of a system of schooling more in accordance with wise discrimination and true patriotism; and if such ample knowledge should teach young Canada to think less of our Province in comparison with the rest of the world, we feel well assured that its final effect will be to make the world at large think more, and with better reason, of this the greatest of all the colonies of the Empire.

D. W.

SCIENTIFIC AND LITERARY NOTES.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

ON THE VARIATION IN THE QUANTITY OF RAIN DUE TO THE MOON'S POSITION IN REFERENCE TO THE PLANE OF THE EARTH'S ORBIT.—BY MR. C. FULBROOK.

The author called attention to an important difference in the amount of rain which falls in these latitudes at opposite parts of the moon's course with reference to the plane of the earth's orbit:—a result obtained by placing horizontally (from the daily register of Howard, in the vicinity of London) the amount of rain (when

any) due to each day throughout a lunar course,—and so on for 100 courses in due order. The following table exhibits the result:—

Position of the Moon with reference to the Plane of the Earth's Orbit in its connexion with the Rain-fall of London and its vicinity, as deduced from a Register of the Weather during 100 courses of that Luminary.

Position of the Moon.	Days.	Amount of Rain.
In greatest South Latitude.	1	
	2	
	3	
	4	
	5	47·60 in. in 500 days. (days 3–7)
	6	
Ascending through the Plane of Earth's Orbit	7	
	8	
	9	
	10	
In	11	
	12	
North	13	
	14	
Latitude.	15	
	16	
	17	
	18	
Descending through the Plane of Earth's Orbit	19	26·42 in. in 500 days. (days 17–21)
	20	
	21	
	22	
In	23	
	24	
South	25	
	26	
Latitude.	27	

ON A LAW OF TEMPERATURE DEPENDING UPON LUNAR INFLUENCE.—BY MR. J. P. HARRISON.

The author commenced by saying that, although the question of lunar influence on the atmosphere of our planet was very generally considered as set at rest by the investigations of M. Arago, yet he felt very confident that he was in a position to prove the law he was now about to announce without fear of contradiction. He had reduced and thrown into the form of tables and of curves 280 lunations, with the corresponding mean temperatures: and the laws at which he had arrived were:—First, between the first and second octant the temperature immediately after the first quarter, both on the average and also, with rare exceptions, in each individual lunation is higher than the temperature shortly before the first quarter; secondly, and more particularly: the mean temperature of the annual means of the second day after the first quarter (or the tenth day of the moon's age) is always higher than that of the third day before the first quarter (or the fifth day of the lunation.)

ON THE EFFECT OF WIND ON THE INTENSITY OF SOUND.—BY PROF. G. G. STOKES.

The remarkable diminution in the intensity of sound, which is produced when a strong wind blows in a direction from the observer towards the source of sound, is familiar to everybody, but has not hitherto been explained, so far as the author is aware. At first sight we might be disposed to attribute it merely to the increase in the radius of the sound-wave which reaches the observer. The whole

mass of air being supposed to be carried uniformly along the time which the sound would take to reach the observer, and consequently the radius of the sound-wave, would be increased by the wind in the ratio of the velocity of sound to the sum of the velocities of sound and of the wind, and the intensity would be diminished in the inverse duplicate ratio. But the effect is much too great to be attributable to this cause. It would be a strong wind whose velocity was a twenty-fourth part of that of sound; yet even in this case the intensity would be diminished by only about a twelfth part. The first volume of the "Annales de Chimie," (1816), contains a paper by M. Delaroche, giving the results of some experiments made on this subject. It appeared from the experiments,—First, that at small distances the wind has hardly any perceptible effect, the sound being propagated almost equally well in a direction contrary to the wind and in the direction of the wind; secondly, that the disparity between the intensity of the sound propagated in these two directions becomes proportionally greater and greater as the distance increases; thirdly, that sound is propagated rather better in a direction perpendicular to the wind than even in the direction of the wind. The explanation offered by the author of the present communication is as follows: If we imagine the whole mass of air in the neighbourhood of the source of disturbance divided into horizontal strata, these strata do not all move with the same velocity. The lower strata are retarded by friction against the earth, and by the various obstacles they meet with; the upper by friction against the lower, and so on. Hence the velocity increases from the ground upwards, conformably with observation. This difference of velocity disturbs the spherical form of the sound wave, tending to make it somewhat of the form of an ellipsoid, the section of which by a vertical diametral plane parallel to the direction of the wind is an ellipse meeting the ground at an obtuse angle on the side towards which the wind is blowing, and an acute angle on the opposite side. Now, sound tends to propagate itself in a direction perpendicular to the sound-wave; and if a portion of the wave is intercepted by an obstacle of large size, the space behind is left in a sort of sound-shadow, and the only sound there heard is what diverges from the general wave after passing the obstacle. Hence, near the earth, in a direction contrary to the wind, the sound continually tends to be propagated upwards, and consequently there is a continual tendency for an observer in that direction to be left in a sort of sound-shadow. Hence, at a sufficient distance, the sound ought to be very much enfeebled; but near the source of disturbance this cause has not yet had time to operate, and therefore the wind produces no sensible effect, except what arises from the augmentation in the radius of the sound-wave, and this is too small to be perceptible. In the contrary direction—that is, in the direction towards which the wind is blowing,—the sound tends to propagate itself downwards, and to be reflected from the surface of the earth; and both the direct and reflected waves contribute to the effect perceived. The two waves assist each other so much the better as the angle between them is less, and this angle vanishes in a direction perpendicular to the wind. Hence, in the latter direction the sound ought to be propagated a little better than even in the direction of the wind, which agrees with the experiments of M. Delaroche. Thus the effect is referred to two known causes,—the increased velocity of the air in ascending, and the diffraction of sound.

REPORT ON THE DEVELOPMENT OF HEAT IN AGITATED WATER.—BY MR. G. RENNIE.

Mr. Rennie, in alluding to his former papers on the subject, read before the Section last year, at Cheltenham, stated that the subject of the mechanical or dynamic force required to raise a given quantity of water one degree of Farenheit had been the object of the research of philosophers, ever since Count Rumford, in his celebrated experiments on the evolution of heat in boring guns when surrounded by ice or water, proved the power required to raise one pound of water one degree, and which he valued at the dynamic equivalent of 1,034 lbs. M. Moya was the first who announced that heat was evolved from agitated water. The second was Mr. Joule, who announced that heat was evolved by water passing through narrow tubes, and by this method each degree of heat required for its evolution a mechanical force of 770 lbs. Subsequently in 1845 and 1847 he arrived at a dynamical equivalent of 772 lbs. These experiments had since been confirmed by other philosophers on the Continent. In the present paper Mr. Rennie stated his attention was called to the subject by observing the evolution of heat by the sea in a storm, and by the heat from water running in sluices. He, therefore, prepared an apparatus similar to a patent churn, somewhat resembling that adopted by Mr. Joule, but on a large scale. In the first case he experimented on fifty gallons, or 500 lbs. of water, inclosed in a cubical box, and driven by a steam engine instead of a weight falling from a given height, as in Mr. Joule's experiment; secondly, on a smaller scale, by 10 lbs. of water inclosed in a box. The large machine or churn was driven at a slow velocity of eighty-eight revolutions per minute, and the smaller machine at the rate of 232 revolutions per minute, so that the heat given off by the water in the large box was only at the rate of three and a half degrees per hour, including the heat lost by radiation; whereas the heat evolved by the ten gallons of water contained in the small box agitated at 232 evolutions was fifty-six degrees Fahrenheit per hour. Thus the temperature of the water in the large box was raised from sixty degrees to 144 degrees, and the temperature of the water in the small box to boiling point. As an illustration, an egg was boiled hard in six minutes. The mechanical equivalent in the first case was found to approximate nearly to that of Mr. Joule, but in the latter case it was considerably above his equivalent, arising, very probably, from the difficulty of measuring accurately the retarding forces.

ON SOME PHENOMENA IN CONNEXION WITH MOLTEN SUBSTANCES.—BY MR. J. NASMYTH.

The author stated, on introducing the above subject to the notice of the Section, that his object in so doing was to direct the attention of scientific men to a class of phenomena which, although their main features might be familiar to practical men, yet appeared to have escaped the attention of those who were more engaged in scientific research. The great fact which he desired to call attention to is comprised in the following general proposition,—namely, that all substances in a molten condition are specifically heavier than the same substances in an unmolten state. Hitherto water has been supposed to be a singular and special exception to the ordinary law,—namely, that as substances were elevated in temperature they became specifically lighter, that is to say, water at temperature 32° on being heated does on its progress towards temperature 40° become more dense and specifically heavier until it reaches 40°, after which, if we continue to elevate the temperature,

its density progressively decreases. From the facts which Mr. Nasmyth brought forward, it appears that water is not a special and singular exception in this respect, but that, on the contrary, the phenomena in relation to change of density (when near the point of solidification) is shared with every substance with which we are at all familiar in a molten state, so entirely so, that Mr. Nasmyth felt himself warranted in propounding, as a general law, the one before stated,—namely, that in every instance in which he has tested its existenee, he finds that a molten substance is more dense, or specifically heavier, than the same substance in its unmolten state. It is on account of this if we throw a piece of solid lead into a pot of melted lead, the solid, or unmolten metal, will float in the fluid, or molten metal. Mr. Nasmyth stated, that he found that this fact of the floating of the unmolten substance in the molten holds true with every substance on which he has tested the existence of the phenomenon in question. As, for instance, in the case of lead, silver, copper, iron, zinc, tin, antimony, bismuth, glass, pitch, rosin, wax, tallow, &c.; and that the same is the case with respect to alloys of metals and mixtures of any of the above-named substances. Also, that the normal condition as to density is resumed in most substances a little on the molten side of solidification, and in a few cases the resumption of the normal condition occurs during the act of solidification. He also stated that, from experiments which he had made, he had reason to believe that by heating molten metals up to a temperature far beyond their melting point, the point of maximum density was, as in the case of water, at 40° about to be passed; and that at such very elevated temperatures the normal state, as regards reduction of density by increase of temperature, was also resumed, but that as yet he has not been able to test this point with such certainty as to warrant his alluding further to its existence.

A MATHEMATICAL INVESTIGATION OF THE PROPORTION BETWEEN THE LENGTH REQUIRED FOR AN ELECTRIC TELEGRAPH CABLE AND ITS SPECIFIC GRAVITY.—BY CAPTAIN BLAKELY.

The author showed, by the principles of the composition of motion, as a telegraph wire was payed out from a ship, the velocity which gravity would give it would soon become uniform by the resistance of the water as its parts descended; therefore, the descending part of the cable from the advancing ship to the part of the cable which had reached and was supported upon the bottom, as he showed, in very deep water, say two miles or more, might stretch back six or more miles from the ship. Now, unless a great strain was kept on the brake in the ship where the cable was paying out, a strain which in the case of the Atlantic cable had caused it to part, it was obvious from this demonstration that there must always be what the sailor termed "slack" in the cable when it reached and lay on the bottom, for the inclined length of the rope was always longer than the horizontal length of the bottom on which it was intended to lie. The author then proceeded to estimate, by mathematical formulæ, and numerically, the exact proportion of these in several supposed depths of soundings, rapidity of paying out, and specific gravity of the cable, and came to the conclusion, that the only way of lessening an evil, which must never be expected to be entirely got rid of, was by increasing the speed of the vessel paying out the cable, and diminishing the specific gravity of the cable itself, so that it should sink gently to its final position.

The *Athenæum* reporter, from whose notes we derive the above abstract, rereports the following interesting discussion in the Section, to which it gave rise:—

Mr. James Thomson did not concur in the view taken by the author, as he conceived that in the method he proposed the cable would be apt to sink in festoons: a bend when once formed by its superior weight dragging down more rapidly than the parts on each side, yet horizontal, and thus the cable would have large folds, or even coils, when it reached the bottom.

During the conversation which arose in the Section after the reading of this communication, a new light seemed to break upon the members, as it seemed to be universally admitted that it was mathematically impossible, unless the speed of the vessel from which the cable was payed out could be almost infinitely increased, to lay out a cable in deep water (say two miles or more) in such a way as not to require a length much greater than that of the actual distance, as from the inclined direction of the yet sinking part of the cable, the successive portions payed out must, when they reached the bottom, arrange themselves in wavy folds; since the actual length is greater than the entire horizontal distance. The fact, therefore, which, when noticed, led to the increasing of the strain on the Atlantic cable until it broke, ought to have been anticipated, and must be provided for in the future progress of that great national undertaking.

ON THE AMOUNT AND FREQUENCY OF THE MAGNETIC DISTURBANCES, AND OF THE AURORA AT POINT BARROW, ON THE SHORES OF THE POLAR SEA.—BY MAJOR-GENERAL SABINE.

Point Barrow is the most northern cape of that part of the American continent which lies between Behring's Strait and the Mackenzie River. It was the station of H.M.S. Plover from the summer of 1852 to the summer of 1854, and to Captain Maguire, now in the Section, and the officers of that ship, they were indebted for the very valuable series of observations which he was now about to lay before the Section, and in part discuss. They were furnished with supplies of provisions, &c., for Sir John Franklin's ships, had they succeeded in making their way through the land-locked and ice-encumbered channel, through which they sought to effect a passage from the Atlantic to the Pacific. In this most dreary and otherwise uninteresting abode, Capt. Maguire and his officers happily found occupation during seventeen months, unremittingly, in observing and recording every hour the variations of the magnetic and concomitant natural phenomena, in a locality perhaps one of the most important on the globe for such investigations. Their observatory, placed on the sand of the shore, which for a long tract nowhere rose much above five feet above the sea, was constructed of slabs of ice, and lined with seal-skins throughout. The instruments had been supplied by the Woolwich establishment, with the requisite instructions for their use; and the observations were made and recorded precisely in the same manner as those of the Colonial magnetic observatories. These were sent by Captain Maguire to the Admiralty, and were in due course transmitted to General Sabine, by whom they were subjected to the same processes of reduction as those made in the Colonial observatories. The author then exhibited to the Section six long rolls, containing the results of this discussion, giving the reduced observations at each of the hours of the twenty-four. A sufficient body of the larger disturbances having been separated from the rest, it was

found at Point Barrow as elsewhere, wherever similar investigations had been made, that in regard to the frequency of their occurrence, and the average amounts of easterly and westerly deflections, the disturbances followed systematic laws depending on the hours of solar time. The laws of the easterly and westerly were also found at Point Barrow, or elsewhere, to be distinct and dissimilar. The author explained how these observations, which manifestly related to those arising from what were called "storm," were separated from the rest; and when that separation was effected, the law of the true solar variation was shown distinctly to be observed. But upon instituting a comparison between the disturbance laws at Point Barrow and Toronto, it was found that the laws of the deflections of the same name at the two stations did not correspond; but, on the other hand, there existed a very striking and remarkable correspondence between the law observed by the easterly at Point Barrow and the westerly at Toronto, and between the law of the westerly at Point Barrow and easterly at Toronto; and this correspondence was shown to exist not in slight or occasional particulars only, but throughout all the hours in well-marked characteristics of both classes of phenomena; and it follows from the correspondence in the hours at which opposite disturbance deflections prevail, that the portion of the diurnal variation which depends upon the disturbances has opposite, or nearly opposite, characteristics at the two stations. The importance of eliminating these disturbances from the regular march of the solar variation was then pointed out in both: for when the diurnal variation is derived from the whole body of observations at Point Barrow, retaining the disturbances, the westerly extreme of the diurnal excursion, which, as is well known, occurs generally in the extra-tropical part of the northern hemisphere a little after 1 P.M., is found to take place at 11 P.M.; but when these larger disturbances are omitted, the westerly extreme falls at the same time as elsewhere—viz., 1 P.M.; and the author suggested the probability that the anomalies which have sometimes been supposed to exist in the turning hours of the solar diurnal variation in high latitudes may be susceptible of a similar explanation. It appears, then, by a comparison of the Point Barrow and Toronto observations, that in the regular solar diurnal variation the progression at the two stations is similar, the easterly and westerly extremes being each reached nearly at the same hours, whilst in the disturbance diurnal variation this progression is reversed. Another distinction exists in their magnitudes, which is found in the solar diurnal variation to be as nearly as may be in the inverse ratio of the values of the horizontal force at the two stations, (which is the antagonistic force opposing all magnetic variation,) whilst on the other hand the increase in the range of the disturbance variation is many times greater than it would be according to the same proportion. It would appear, therefore, that the absolute disturbing force must be much greater at Point Barrow than at Toronto. The author then proceeded to point out the concomitant occurrences of the auroral manifestations. The observers noted at each hour whether or not there was an auroral display: from 11 A.M, to 3 P.M. no auroral displays were ever observed; but the number of them was found progressively to increase from 3 P.M. to 1 A.M., and then again in regular progression to decrease to 0, at 11 A.M. The frequency of the occurrence of the aurora may be judged of, when it is said that during six months,—December, January and February of 1852–53, and the same of 1853–54,—the aurora was seen six days out of every seven. The hour of the day at which no auroral display is ever observed corresponds with the minimum of westerly disturbance, while the maximum

of both is found at the same hour of westerly disturbance—viz., 1 A.M. The frequency of the aurora, also, and the amount of westerly deflection of the magnet also accord; whilst on the other hand the auroral hours appear to have little or nothing in common with the turning hours or the progression of the easterly deflections. When Sir John Franklin was going out on the expedition which deprived his country of the invaluable services of himself and his brave companions, he had been furnished by the Admiralty both with instruments carefully adjusted and compared with standard, and with full instructions for their use, and for the making and recording hourly observations of the utmost importance in the several stations he might occupy in these seas; and in the last letter which had ever been received from him, he had expressed his determination to put up those instruments at the several stations at which he should winter. Now when his ardour in these pursuits and that of Capt. Crozier, the second in command, and the other officers, were taken into account, there could remain no doubt that such observations had been made and recorded, and that these records still existed in some of the places he had last been in. When he (General Sabine) was with Capt. Parry, in 1818, they had made observations with the pendulum for determining the figure of the earth, and others of great scientific importance, on their way towards Behring's Straits. They had been exposed to considerable risk of the ships being lost, and were about to take to the boats and proceed overland, and in preparation for this they merely prepared to carry with them abstracts of the observations, leaving the original full records safely deposited in secure cases in the cabins of the ships, to be found by those who doubtless would be sent out to look for them. He had, therefore, no doubt that if the ships of Sir John Franklin were still in existence, in their cabins were to be found those scientific treasures; and this was one of the reasons why men of science were so anxious to have the ships carefully looked for, and it was a sacred duty even to the memories of those who had sacrificed their lives in procuring such results, to do them the justice and honour of having them recovered if possible.

ON CERTAIN PLANETARY PERTURBATIONS, AND ON A NEW PERTURBATION ON ENCKE'S COMET.—BY THE REV. W. E. PENNY.

It appears that there are in the motions of several of the planets inequalities arising from the product of the disturbing forces of two planets, which inequalities appear not to have been noticed hitherto, unless very lately, but which seem to be much larger than might have been expected, owing to the length of time during which they are accumulating. The most remarkable is one which exists in the motions of Mars and the Earth. Its period is about 1,800 years, or about twice that of the long inequality of Jupiter and Saturn. In the case of the Earth it appears to amount to about $7\frac{1}{2}$ seconds, and is owing to the product of the disturbing forces of Jupiter and Mars, and in the case of Mars it seems to amount to about $45\frac{1}{2}$ seconds, and is owing to the product of the disturbing forces of Jupiter and the Earth. It arises from the fact, that 4 times the mean motion of the Earth is very nearly equal to 8 times that of Mars *minus* 3 times that of Jupiter. Its value for the Earth is represented by the following equation:—$\delta\theta_2 = 7{\cdot}293'' \sin (8n_3 t - 4n_2 t - 3n_4 t + 8\epsilon_3 - 4\epsilon_2 - 3\epsilon_4 + 75^\circ{\cdot}14')$; and for Mars by the equation:—$\delta\theta_3 = -45{\cdot}684'' \sin (8n_3 t - 4n_2 t - 3n_4 t + 8\epsilon_3 - 4\epsilon_2 - 3\epsilon_4 + 73^\circ{\cdot}34')$: where n_2, n_3, n_4,

are the mean motions of the Earth, Mars, and Jupiter. This inequality is remarkable as being, if the work is correct, larger, and in the case of Mars very considerably so, than any which arise from the simple perturbation of a single planet, —the largest hitherto known in the case of the Earth amounting to only 7·15", and in the case of Mars to 25·5". Also, there will be a corresponding inequality in the motion of the Moon, which I have not yet examined, but which may, perhaps, be sensible; for, according to the investigations of M. Hansen, the inequality in the motion of the Earth discovered by Prof. Airy, amounting to 2·04", with a period of 240 years, produces one of not less than 28" in the motion of the Moon, —so that, judging by analogy, there ought to be a sensible inequality in the present case also. Again, there seems to be an inequality in the motions of Jupiter, Saturn, and Uranus, with a period of somewhat more than 1,700 years, and amounting in the case of Jupiter to about 10"; and in the case of Saturn to about 40", and in that of Uranus to 43". It arises from the fact, that 6 times the mean motion of Saturn is nearly equal to twice that of Jupiter *plus* 3 times that of Uranus. There are several others besides these, of less importance, arising from the product of two disturbing forces; and there is even one which results from the product of three forces, and appears to amount to nearly 7". There are also several inequalities of the same kind in some of the asteroids, which are very much larger than any in the motions of the principal planets; but as the theory of the asteroids is considered to be of comparatively little interest, I have not communicated them.

But the most remarkable inequality of all of this kind is one which exists in the motion of the comet of Encke, and which is due to the product of the disturbing forces of Jupiter and Saturn. The mean motion of this comet is very nearly equal to 4 times that of Jupiter *minus* that of Saturn, or stated in other words, $\frac{n - 4n_4 + n_5}{n}$ is a very small quantity,—so that there will be a considerable inequality of the form P $sin\,(nt - 4n_4 t + n_5 t + \theta)$, and also another of the form P′ $sin\,(2nt - 8n_4 t + 2n_5 t + \theta')$. This latter term, I find, appears to account for at least a very considerable part of the remarkable acceleration which has been observed in the mean motion of this comet; but owing to peculiar difficulties which beset the question, I am not able to say whether it accounts for the whole of it or not. There will also be a remarkable inequality, arising from a similar cause, in the motions of comets of short period.

ON THE ELECTRIC FISHES AS THE EARLIEST ELECTRIC MACHINES EMPLOYED BY MANKIND.—BY GEORGE WILSON, M.D., F.R.S.E., REGIUS PROFESSOR OF TECHNOLOGY, UNIVERSITY OF EDINBURGH.

Were the question put to a circle of scientific men, "With what form of electrical apparatus were mankind first acquainted?" we should be certain to hear much ingenious discussion concerning the date of Von Kleist's earliest Leyden jar (1745), Hauksbee's glass friction-machine (1709), and Otto Von Guericke's famous sulphur ball (1670). Few however, would go further back than this primitive instrument, unless the magnet were included among electrical apparatus, which in the form of the compass-needle it cannot be; and even if we dignified with the name of instru-

ments the pieces of amber and precious stones which the predecessors of Guericke rendered attractive and luminous by friction, we should gain nothing by going beyond 1600, when Gilbert, the introducer of the word *electricity*, published his truly scientific treaties "De Magnete." The discussion would thus range at utmost over only two centuries and a half; and as the Magdeburgh sphere of sulphur is the earliest artificial arrangement which can be fairly called a machine, our oldest electrical instrument is apparently less than 200 years old.

Such, accordingly, has been the conclusion of our historians of Electricity; nor did it occur to me, whilst prosecuting researches into the early history of electrical instruments, to doubt its accuracy. Last summer however, I was directed towards a new channel of inquiry, by a paper read to the Archæological Institute at its meeting in Edinburgh by my colleague Professor Simpson, in which he drew attention to the application of the living torpedo as a remedial agent by the ancient Greek and Roman physicians, in demonstration of the antiquity of the practice of employing electricity therapeutically. I had not looked at the subject in this light before, but inquiry soon satisfied me that a living electric fish was the earliest, and is still the most familiar, electric instrument employed by mankind. Before entering into the proof of this it is worth while noticing, that although the historians of Electricity have not overlooked the fact that the ancients were aware of the electrical powers of the torpedo, they have passed unnoticed the early therapeutic employment of the fish, as a truth which, however interesting to the naturalist or the physician, had no significance for them. Priestley for example, in his "History and Present State of Electricity," 1775, refers to the gymnotus as "possessed of a kind of natural electricity, but different from the common electricity, in that persons who touch it in water are shocked and stunned by it, so as to be in danger of drowning" and quotes Muschenbroeck's query, "whether the sensation communicated by the torpedo does not depend upon a similar electricity?" But both references occur under "Miscellaneous Experiments," illustrating the then "present" state of electrical science, and no historical importance is attached to them. This is the more remarkable, that when Priestley wrote, the only electrical power known to characterize the fishes which he names was that of giving the "shock;" and so marvellous did this phenomenon appear to him, that he goes the extreme length of declaring, that "the electric shock itself, if it be considered attentively, will appear almost as surprising as any discovery that Sir Isaac Newton made; and the man who could have made that discovery by any reasoning *a priori* would have been reckoned a most extraordinary genius."

It seems strange, after these statements, that Priestley should have given no place in his history either to the ancient recognition of the shock-giving power of the torpedo, or to its application as a remedial agent; but the explanation of his silence probably lies in the fact, that he was not fully satisfied that the shock of the torpedo or gymnotus was electrical. "It is to be regretted," he says, "that none of the persons who have made experiments on these fishes should have endeavoured to ascertain whether they were capable of exhibiting the phenomena of attraction and repulsion, or the appearance of electric light, as experiments of this kind are of principal consequence, and must have been easy to make." Later historians of Electricity, especially those writing after the experiments thus referred to, had (in spite of difficulty, which Priestley quite undervalued) been successfully made, have not failed to quote the classical references to the torpedo, but have attached no importance to its medical use; and no Natural Philosopher, so far as I

am aware, has even hinted the claim of the electric fishes to rank first in order of time among electrical instruments.

The subject is one of greater interest to physicists than to naturalists, but I bring it before the Natural History Section of this Association rather than before the sections devoted to Physics and Chemistry, in the hope of inducing naturalists placed in favourable localities to enquire how far uncivilized nations familiar with electric fishes employ their powers remedially.

The subject admits of a twofold division,—into, 1*st*, The antiquity of the practice of using the electrical fishes as remedial agents; 2*d*, The extent or generality of that practice.

So far as I have yet ascertained, the fishes which have been or are thus employed are limited to different species of the torpedo, the gymnotus, and the silurus or malapterurus; the first a widely distributed marine genus, the second abounding in many of the rivers of South America, and the third in certain of those of Africa. Of none of these fishes but the gymnotus can it with certainty be affirmed, that those who made use of them were aware that they were electrical instruments; and in the case of the gymnotus this remark applies only to its therapeutic use in very recent times. There is reason, indeed to believe that it had been employed for centuries by the South American savages as a mysterious heroic remedy; but in speaking of the zoo-electric machine as the earliest electric instrument, I must throughout be understood as looking at the living apparatus from a modern electrician's point of view.

The antiquity of the practice first concerns us, and must be rested chiefly on the torpedo, as employed by the civilized dwellers on the shores of the Mediterranean. From their writings we can trace the practice back for nearly two thousand years; certainly to before the Christian era.

On this point I shall mainly be content to quote the statements of the Rev. C. David Badham, M.D. In his learned and most amusing volume, "Prose Halieutics, or Ancient and Modern Fish Tattle," he thus writes of the torpedo under its Greek name Νάρκη;—"Besides those Sicarian Skate., there is one of much smaller dimensions, but of far more marvellous powers, which long before Leyden phials were invented, or the principles of electricity were understood, had pressed this redoubtable agent into its service, and was wont to give practical lessons in the science to all who did not object to the 'charge.' The peculiar powers of this fish are cursorily alluded to, or commemorated at length, by a whole host of ancient writers,—

> 'Quis non edomitam miræ torpedinis artem
> Audit et emeritas signatas nomine vires?'

asks Claudian; Plato compares Socrates to a Narké, from that sage's well-known capabilities of electrifying his auditory; and its achievements have been amply detailed by Aristotle, Cicero, Plutarch, Pliny, Oppian, Ælian, Athenæus, and Galen." So far as medical use is concerned, Dr. Badham observes, that "the electric properties of this enchantress of the sea suggested to ancient practitioners to try its efficacy in the cure of headache and painful nervous affections, by applying it epidermically; and Dr. Galen, who seems to have been a strong homœopathist, advises the numb-fish (which he erroneously supposed to retain some electrical virtue after death and stewing) as a dish to paralytic patients, with a view to cure their numbness: no doubt on the *similia similibus* principle."

Whether Galen held the theory which Dr. Badham, half in jest, half in earnest, attributes to him, it is interesting to know that the term torpedo (happily translated numb-fish), implies that the Roman physicians were more struck by the ultimate paralyzing effect of the torpedo's discharge than by the earlier convulsing one. Galen, indeed, referred the powers of the fish to its exertion of "a torporific action peculiar to itself," so that we can scarcely say that he looked upon an electric fish as a shock-machine. We must not however, attach too much importance to the mere name of the one electric fish known to the classical naturalists and physicians. The sensations excited by what a modern physician would call the discharge of electricity, great in quantity, and moderately high in intensity, through the body, are in reality indescribable; but the ancient observers have depicted those sensations, to the extent that they had experienced them, as faithfully as any modern has done. We acknowledge, and escape the difficulty of precise description, by calling the sensations in question as a whole, "an electric shock." And as the ancients were familiar with the "shock," though they had no single term for it, I count it no anachronism to say that the torpedo was for them as for us, a living, electric shock-machine. The title, it will be observed, is a distinctive one, applicable only to a few creatures. The observations of Galvani, interpreted and greatly extended by Matteucci, Müller, Dubois Reymond, and others, have shown us that the higher animals, and probably all animals, are in a true sense electric machines, but not that they are shock-machines. They constantly develop electricity; but to the slight extent that it acts externally to their bodies, its quantity is too small, and its intensity too low, to confer upon it the slightest shock-giving power; the animal cannot, by an act of volition, influence the electrical currents which it unconsciously develops. On the other hand, a few creatures, all scaleless inhabitants of the waters, develop electricity, great in quantity, high in intensity, and admitting, as the creature wills, of being retained latent, or set free with killing force. These fishes thus correspond to our artificial therapeutic electric instruments, such as the coil-machine, in the quantity and quality of the electricity they furnish, but differ from them in this important particular, that we cannot compel them to give a shock any more than we can compel a leech to bite or to suck blood. So much are we at the mercy of their will in this matter, that in the case of the torpedo, Badham, speaking of himself, says, "We were not able, during a long sojourn at Naples, to obtain one shock in our own person; while many lazzaroni friends, who did not seek it, had frequently their arms 'astonished' (the word is Réaumur's) for a whole day after lugging a narké on board." How far the ancients realized this fact, of which to some extent they must have been cognisant, and what devices they followed to induce the torpedo to give its shock, does not appear very clearly from the Greek and Roman writings which have came down to us. Galen's ascription of similar properties to the dead as to the living torpedo, is not reconcilable with the belief that he was fully aware of the purely voluntary nature of the electric discharge. The same remark in all likelihood may be applied to the majority of the ancient practitioners who employed the torpedo in medicine. Nevertheless, it will be seen from their prescriptions, copied in the sequel, that they were generally strict in requiring that the fish should be alive, and whatever antiparalytic virtues Galen may have attributed to its cooked body, he denies that it has any narcotic effect as a medicine, unless when applied alive." A similar conviction probably led to the cruel practice of boiling the living torpedo in oil, with a view to produce an anodyne liniment. On this point,

as on others connected with the subject before us, we may look for more precise information than at present we possess, when the great work on the Greek and Latin physicians, in course of publication at Paris, has made further progress. Meanwhile, the following references to the torpedo, will sufficiently illustrate the electro-practice of the ancient physicians. I quote them in chronological order, so far at least as centuries are concerned. Asclepiades who flourished in the first century, B.C., employed the torpedo in inflammation; but only fragments of his works have reached us.

Of the application of the torpedo as a stupefacient, we find mention in several writers anterior to Scribonius: Nicander alludes to it; and Asclepiades, who practised medicine in Rome a century before Scribonius, employed it in inflammation: and Anterus, a freedman of Tiberius, was successfully treated for gout through the application of a live torpedo, by advice of Charicles.

Pliny (first century) has many references to the torpedo. The following is one of the more general and speculative:—

"And then, besides, even if we had not this illustration by the agency of the echeneïs, would it not have been quite sufficient only to cite the instance of the torpedo, another inhabitant also of the sea, as a manifestation of the mighty powers of nature? From a considerable distance even, and if touched only with the end of a spear or staff, this fish has the property of benumbing even the most vigorous arm, and of riveting the feet of the runner, however swift he may be in the race. If, upon considering this fresh illustration, we find ourselves compelled to admit that there is in existence a certain power which, by the very exhalations, and as it were, emanations therefrom, is enabled to affect the members of the human body, what are we not to hope from the remedial influences which nature has centered in all animated beings?"

The succeeding quotations illustrate more precisely the mode of applying the torpedo:—

Scribonius Largus (first century) thus writes:—"Capitis dolorem quemvis veterem et intolerabilem protinus tollit, et in perpetuum remediat torpedo viva nigra, imposita eo loco qui in dolore est, donec desinat dolor, et obstupescat ea pars; quod quum primum senserit, removeatur remedium, ne sensus auferatur ejus partis. Plures autem parandæ sunt ejus generis torpedines, quia nonnunquam vix ad duas tresve respondet curatio, id est torpor; quod signum est remediationis."

Galen (second century) refers in similar terms to the treatment of headache: "Sed et torpedinem totam, dico autem animal marinum, capitus dolores sanare capiti admotam sedemque eversam coërcere à quibusdam est proditum. Verum ego quum utrumque essem expertus, neutrum verum comperi. Eam igitur cum cogitassem vivam esse applicandam, cui caput doleret, posse enim fieri ut hoc medicamentum anodynon esset, ac dolore liberaret similiter ut alia quæ sensum obstupefaciunt, ita habere comperi. Putoque eum, qui primus est usus tali quapiam motum ratione experiri aggressum."

Aëtius, who wrote in the end of the fifth century, does little more than abbreviate the prescriptions of his predecessors:—"Torpedo viva apposita diuturnum capitis dolore depellit, et prolabentem sedem intrò pellit mortua verò, aut omnino non, aut modice hæc facit."

Paulus Ægineta (end of the sixth or the beginning of the seventh century), who as his learned commentator, Dr Francis Adams, tells us, "continued to be looked

up to as one of the highest authorities in medicine and surgery during a long succession of ages," thus condenses the opinions of his predecessors:—"Torpedo; when applied to the head, *while still alive,* in cases of headache, it procures relief, to the pain, probably by its peculiar property of producing torpor; and the oil in which the *living* animal has been boiled, when rubbed in, allays the most violent pains of the joints." The accomplished scholar, whose translation I have quoted, refers, in the relative commentary and elsewhere, to the general employment of the torpedo by the Greek, Roman, and Arabian physicians, adding the significant query—"Is not this an application of the principle of galvanism in medicine?"

Marcellus (whom I quote out of order) prescribes standing on a live black torpedo, on a moist shore which has been washed by the sea, till torpor is felt through the feet up to the knee, as a cure for gout.

From these accounts, and especially from that of Scribonius Largus, it appears that in the treatment of severe and obstinate headache, the torpedo was laid on the aching head, or aching part of the head, and left there till it had thoroughly benumbed it. The fish was probably wetted occasionally with sea-water (as Marcellus plainly intends), or immersed in it, otherwise it must soon have ceased to be "*torpedo viva;*" but whether dead or alive, its good effects must have frequently been owing as much to its acting as a cold poultice or wet bandage, as to its efficiency as an electric machine. It was faith, however, in its electrical powers that led to its therapeutic use; and this is all that concerns the present inquiry.

How early the torpedo was employed in medicine cannot be precisely determined. The labours of Daremberg and his colleagues will doubtless throw light on this point; but as Scribonius Largus, Pliny, and other writers of the first century, all describe the medical use of the torpedo, and Asclepiades and Nicander refer to it a century earlier, it at least dates from before the Christian era. It is probable, also, that the ancient physicians borrowed their torpedinal remedy from the Mediterranean fishermen long after they had acquired faith in it; and altogether we may safely say, in round numbers, that the electrical machine, as embodied in the torpedo, is at least 2000 years old. It is probably very much older, for barbaric nations love what the French call "heroïc" remedies; and the shock of the provoked torpedo is likely to have been held medicinal by the earliest fishermen of the Mediterranean sea. It would be interesting to ascertain whether the Italian sailors of the present day have any traditional respect for the torpedo as a medicine. It is sold in the Neapolitan markets as an article of food; but I do not know if Galen's successors agree with him in imputing to it medicinal virtues after it is cooked. Apparently not; but the naturalists and electricians of Italy, a country prodigal of both, will enlighten us on this not unimportant matter.

Another electric fish besides the torpedo was known to the civilized nations of antiquity, and to nations whose civilization is of much earlier date than that of the Greeks and Romans. The Nile breeds one electrical fish, if not more; and when we remember what an inquisitive, intelligent people the ancient Egyptians were, and that both their medical skill and their practice of animal worship were likely to interest them in the singular endowments of the electric fish, we may well expect to find its powers chronicled, if not employed, by their priests and physicians. As yet, however, nothing has been extracted from either the hieroglyphics or the paintings on the tombs to fulfil this expectation. A very competent authority, indeed, adduces the *absence* of pictorial representations of the Nile fish from the Egyptian monuments as a proof of the special esteem with

which it was regarded. "It might reasonably be expected," says Sir J. Gardner Wilkinson, "that the *raad*, or electric fish of the Nile, would be one of the most sacred, and forbidden for food; and it seems not to be represented among those caught in the ancient fishing scenes." He adds regarding the raad:—"It is a small fish, and the one I saw measured little more than a foot long by four inches in depth, but it had the power of giving a very strong shock. It is the *Melapterurus electricus*, and may have been the ancient *Latus*." Thus far Egyptian antiquity is silent as to the very existence of an electric fish; but the name by which the malapterurus is known to the modern Egyptians, has been referred to as proving that their predecessors had more or less precisely ascertained that the same force which is present in the thunder-cloud is present in the shock-giving fish. If this view is well founded, it is difficult to say how remote the period is to which we must carry back the commencement of electrical science, if not also of electrical art. Mr. Murray embodies the questionable view of this subject in the statement, "the silurus of which we have to speak is the *silurus* of the Nile (*Malapterurus electricus*), called raasch, or thunder-fish, by the Arabs."

Wilkinson, referring to the same subject, says, "the name *raad* 'thunder' is very remarkable, since the modern Egyptians are quite ignorant of its peculiar powers; and if it was borrowed by them from their predecessors, the question naturally arises, were they acquainted with electricity?" The author probably intends here by "predecessors," the more ancient Egyptians, on whose customs and character he has thrown so much light. As the word *raad*, however, is Arabic, its origin, though ancient, may be much later than the latest of the Pharaohs. Assuming, apparently, this view, Alexander Von Humboldt asks, "did an ingenious and lively people, the Arabians, guess from remote antiquity that the same force which inflames the vault of heaven in storms is the living and invisible weapon of inhabitants of the waters? It is said that the electric fish of the Nile bears a name in Egypt that signifies thunder." It might be pleaded in behalf of this view that the sagacious Arabian physician Averrhoes explicitly affirmed of the torpedo, as Dr. Badham notices, that "the power which this fish possesses of affecting the skin, seems to be of a kind analogous to that by which the magnet acts upon steel," and would have extended this explanation to the silurus. To what extent, however, this ambiguous utterance is to be understood as implying the discovery by Averrhoes of the bond which modern science has shown to unite electricity and magnetism, and the expression by himself or his countrymen of this truth in the name given to the silurus, it is needless to inquire, till we have disposed of the philological question, does the word *raad* really signify thunder-fish? The reply must be in the negative. Humboldt himself became satisfied of this, and states in a note to the passage already quoted, "It appears however that a distinction is to be made between *rahd*, thunder, and *rahadh*, the electrical fish; and that this latter word means simply 'that which causes trembling.'"

The question is one which only Arabic scholars can answer, and I have accordingly referred it to Mr. Edward Stanley Poole, a learned Orientalist, whose decisive reply I give in full:—"I fear the electric fish of the Nile will not sustain the credit of my ancient Egyptian friends for scientific knowledge. The Arabic appellation of the fish in question, namely *raa'ád*, is certainly given to it on account of its *causing trembling*. This is sufficiently plain, from a comparison of words from the same root; and is expressly asserted in an excellent Arabic work, 'Ab-

dollatiphi Historiæ Ægypti Compendium.' The Arabic appellation of thunder is somewhat different (*raad*), and has evidently originated from the supposition that thunder is a trembling, or a state of agitation of the clouds; or from its being a cause of trembling. For the former of these two derivations we have the authority of El-Beydàwee, in his 'Commentary on the Kur-àn. 'Raa'àd' is a generic noun, and 'Raa'àdeh' is a noun of unity, meaning a single fish of the kind called 'Raa'àd.' My reading of these words admits of no doubt, and is well known to Arabic scholars."

The modern Arabic name of the Nile electric fish thus does not justify the conclusion, that the Egyptians of past or present times believed that the shock of the fish was the same in nature as a lightning-shock. A name exactly equivalent in meaning is given, as Humboldt incidently informs us, to the gymnotus as well as the torpedo, by the South American Spaniards "who confound all electric fishes under the name of *tembladores*, literally "tremblers," or "producers of trembling."

At the present day the silurus of the Nile is sold in the markets of Cairo, and used as food.

The second point to be considered is the extent or generality of the practice of using electrical fishes as shock-machines. In this, however, as in other matters, it will be found that extension in space to a great degree corresponds to duration in time.

In ancient epochs the torpedo was probably employed medically on all the shores of the Roman empire, including our own, which it visited, and traces of its therapeutic use probably survive in some of them to the present day. I am unable, however, to indicate any such traces more precise than that the shock-giving powers implied in its vernacular titles, such as the Maltese name of *Haddayla*, a term which has reference to its benumbing powers; the French one, *La Tremble;* and the English, specially expressive names *cramp*-fish and *numb*-fish.

One modern people, however, makes use of the torpedo exactly as the ancients did, though whether as a tradition from the Mediterranean electro-physicians, or as an independent discovery, I have not the means of ascertaining. The Abyssinians, Dr. Bradly tells us, employ the torpedo (I presume from the Red Sea,) in the treatment of ferver. "The patient is first strapped to a table, and the numb-fish then applied successively over every organ of the body: the operation is reported to be both very painful and successful."

Next to the torpedo, the gymnotus is the most famous among electrical fishes, and it is by far the most powerful. The shock indeed, of a large gymnotus is so severe, that no lover of heroic remedies, having one at command, need long for a magneto-electric coil machine. Several species or varieties of the fish occur, as Humboldt tells us, in the large rivers of South America, the Orinoco, the Amazon and the Meta, besides frequenting their tributaries, and the smaller streams of an extensive bordering region. They have accordingly been familiar for centuries to the Indians, who are constantly reminded of their presence, even in rivers too deep to let them be caught or frequently seen, by the shocks which they feel when bathing or swimming in the river. The shallower streams, also, and basins of stagnant water, near the sources of the Orinoco and elsewhere are, in this writer's words, "filled with electrical eels," so that their shock-giving powers are forced upon the attention of all visiting those districts; and we cannot but feel curious to know whether any therapeutic use has ever been made of living machines so powerful.

At first sight it might appear that their very power had prevented their use. Humboldt mentions that "the dread of the shocks caused by the gymnoti is so great, and so exaggerated among the common people, that during three days we could not obtain one, though they are easily caught, and we had promised the Indians two piastres for every strong, vigorous fish." And that this fear, however exaggerated, is in the main well founded, is rendered certain by the unexceptionable testimony of Humboldt himself, not only in his famous account of the battle between the wild horses of the savannahs and the gymnoti, whose favourite pools they reluctantly invaded, but also in his description of the effect of a gymnotus-shock received in full force by himself.

"It would be temerity," says he, "to expose ourselves to the first shocks of a very large and strongly-irritated gymnotus. If by chance a stroke be received before the fish is wounded or wearied by long pursuit, the pain and numbness are so violent that it is impossible to describe the nature of the feeling they excite. I do not remember having ever received from the discharge of a large Leyden jar a more dreadful shock than that which I experienced by having imprudently placed both my feet on a gymnotus just taken out of the water. I was affected during the rest of the day with a violent pain in the knees and in almost every joint. To be aware of the difference that exists between the sensation produced by the voltaic battery and an electric fish, the latter should be touched when they are in a state of extreme weakness. The gymnoti and the torpedos then cause a twitching of the muscles, which is propagated from the part that rests on the electric organs, as far as the elbow. We seem to feel at every stroke an internal vibration, which lasts two or three seconds, and is followed by a painful numbness. Accordingly, the Tamanac Indians call the gymnotus, in their expressive language, *arimna*, which means, something that deprives of motion.'"

We cannot wonder, then, that the Indians who had experiences, such as Humboldt underwent, and who, unlike the philosopher, were unacquainted with the limits within which the shock-giving power of the gymnotus is restricted, should be unwilling to provoke its anger. This, however, has not kept them from employing it in medicine. All my information on this point is derived from Humboldt, and he does enter into details, but the following statement is sufficiently explicit:—

"In Dutch Guiana, at Demerara for instance, electric eels were formerly employed to cure paralytic affections. At a time when the physicians of Europe had great confidence in the effects of electricity, a surgeon of Essequibo, named Van der Lott, published in Holland a treatise on the Medical Properties of the Gymnotus. These electric remedies are practised among the savages of America, as they were among the Greeks."

I have not been able to obtain sight of Van der Lott's work, but Humboldt plainly records the Indian use of the gymnotus in medicine as a device of the Americans, not an imitation of European practice.

From a further statement it appears that the Spaniards had not taught this practice to the Indians, or borrowed it from them. "I did not," observes Humboldt, "hear of this mode of treatment in the *Spanish* colonies which I visited; and I can assert that, after having made experiments during four hours successively with gymnoti, M. Bonpland and myself felt till the next day a debility in the muscles, a pain in the joints, and a general uneasiness, the effect of a strong irritation of the nervous system."

On this point it remains to state, that even in Europe the gymnotus has been used as an electric machine in the end of last century. One sent from Surinam to Stockholm lived more than four months in a state of perfect health. "Persons afflicted with rheumatism came to touch it in hopes of being cured. They took it at once by the neck and tail: the shocks were in this case stronger than when touched with one hand only. It almost entirely lost its electrical power a short time before its death." In this case, the gymnotus was known to yield electricity by those who employed it; but the practice was probably borrowed from the aborigines of its native country. At all events, it is quite certain that, alike without knowledge of artificial electrical machines, or acquaintance with the therapeutic uses to which the Greeks and Romans put the torpedo, the wild Indian doctors had made trial of the healing electric virtues of the living gymnotus.

Within the last three years a new electric fish has become known to us, belonging to the same genus as the *silurus* or *malapterurus* of the Nile. It is found in the muddy brackish water of the River Old Calabar, near Creek Town, which lies about sixty miles up that river. This stream empties itself into the Bight of Benin, within a short distance from the delta of the Niger, in lat: 5½° north, and long. 8° east. The fish, accordingly, has been named the *Malapterurus Beninensis* by Mr. Andrew Murray, who has described and figured it in the *Edinburgh Philosophical Journal* for July 1855.

We are indebted to the zealous and intelligent missionaries of the United Presbyterian Church of Scotland, resident at different stations on the River Old Calabar, for our knowledge of the new species of electric fish. Quite recently they have sent home living specimens, some of which are now in Edinburgh: and through the kindness of Professor Goodsir and Mr. Murray, I, along with others interested in the electric energies of the animal, have had the opportunity of observing their shock giving powers. The shock is a sharp one, felt from the fingers to the wrist, the elbow, or the shoulder, according to the activity of the animal, and the position in regard to it of the hands of the experimenter. The fish varies in length from two to twelve inches, is sluggish in its general movements, but retentive of vitality and electrical energy even in unfavourable circumstances.

As soon as my attention was turned to the remedial employment of electric fishes, I proceeded to inquire whether the Africans along the Old Calabar river made any therapeutic use of its malapterurus. But before my inquiries were completed, I learned that the natives did make this use of the fish. In truth, the fact had been published by Mr. Murray two years ago, but I had overlooked the circumstance. The statement which is quoted below, is the more interesting, that it was not furnished in reply to queries, but was volunteered by Mr. W. C. Thomson, who was stationed for several years at the Creek Town Mission station on the River Old Calabar. Mr. Murray says:—"Mr. Thomson tells me that the electric properties of the fish are made use of by the natives as a cure for their sick children. The fish is put into a dish containing water, and the child made to play with it: or the child is put in a tub or other vessel with water, and one or more of the fish put in beside it. It is interesting to find that a remedy which has only of recent years come into favour among ourselves should have been already anticipated by the unlettered savage, who probably has had the remedy handed down to him by tradition from remote generations."

Unaware of this very precise announcement and inference, I applied to the Rev. W. Anderson, who brought from Old Calabar the living fishes at present in Edinburgh, and received the following answer:—

"In reply to your query, I have to state that I am not aware of any statement having been published in reference to the remedial properties of a shock from the fishes, neither have I ever seen them used in any way in sport; but Mrs. Anderson, to whom belongs all the credit of bringing the fishes home, testifies that the native mothers generally keep one of the fishes in a native-made basin, and that on washing their infants in the morning the practice is to dip either the hands or the feet of the infant, so as to cause it to receive a shock. This is done, they say, for the purpose of *strengthening* the child. The strong and the healthy have to undergo the operation as well as the weak and sickly." And that the fish is not an inactive agent in this singular process may be safely inferred from what follows— "So far as Mrs. Anderson's observation goes, there is no liking for the affair on the child's part; plenty of struggling and squalling. The natives use the fish as food."

A third and independent account of the native usages in reference to the malapterurus has been furnished by Mr. John R. Wylie, recently a teacher at Creek Town, Old Calabar, but at present in Edinburgh on sick leave. Mr. Wylie says: "The Calabar women use this fish in the following manner: They put one or two, according to size, in a tub of water, and then wash their children (infants) in the tub with the fish and all. They must have a strong sense of the benefit derived from this, as in general they dislike doing anything which makes their infants cry; and this process makes them do so most lustily. They also make the children drink a great quantity of the water in which these fish have been. I have been in yards, and seen, on several occasions, the process described."

The ascription of remedial virtues to the water in which the malapterurus has been kept, is a fact of interest when taken in connection with the similar opinion entertained by the Greeks, according to Ælian, in reference to the water in which a torpedo had lain.

After the triple testimony adduced, it will not be doubted that the employment of the malapterurus as a remedial electric machine is an established practice among the natives of Old Calabar; and few will question the justness of Mr. Murray's inference, that the practice is one of great antiquity among them.

It thus appears, that the nations bordering the Mediterranean, the Abyssinians, the Indians of South America, and the dwellers on the western rivers of Africa, have independently used the torpedo, the gymnotus, and the malapterurus as living shock-machines. The practice certainly dates from before the Christian era, so far as the first-named fish is concerned, and in all probability is of much earlier date for all the electric fishes.

Two conclusions, accordingly, seem unavoidable; namely, 1st. That the oldest electrical machine employed by mankind was the living electric fish; 2nd. That the electric machine most familiar to mankind is also the electric fish. The latter conclusion is of much less interest to myself than the former; and daily as galvanic batteries, and other electrical apparatus, are more widely known, it will become less significant. But as the present usages of uncivilized nations represent their past usages back even to a remote antiquity, the light in which a barbaric people still regards creatures so remarkable as the electric fishes is certain in most cases

to illustrate the history of electrical science and electrical art. Writing as a physicist, I would remind naturalists, that it was the careful study of the powers of the torpedo that first enabled electricians to understand some of the most important laws of action of their artificial machines and batteries. I have elsewhere pointed out, that in Cavendish's "Account of some Attempts to Imitate the Effects of the Torpedo by Electricity" will be found the first enunciation of that distinction between *intensity* and *quantity* as affecting electrical phenomena, which has since proved so important a guide to the explication of electrical problems. Faraday dwells largely on this point, nor does it admit of the slightest doubt, that inorganic electricity, both as a science and an art, is very largely indebted to organic electricity in it for the explanation of the laws which it obeys, and for the contrivances by which it works.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

ON THE FORMATION OF CONTINENTS.—BY PROFESSOR BENJAMIN PEIRCE, OF CAMBRIDGE, MASS.

The interest which attaches to the comprehensive theory embraced in this important communication of Professor Peirce, tempts us to print the following unauthenticated abstract, in the absence of any more trustworthy report. In justice to the author, however, it must be borne in remembrance that it is derived from the reports of the Montreal press; and, at best, only serves to indicate the author's line of argument.

Prof. Peirce remarked that the principle lines of the continents are arcs of great circles tangent to the polar circles. Any globe will illustrate this. The eastern coast of South America and the western coast of Europe are in such a line. So also are the eastern coasts of Africa, Asia, and North America. The western side of Hindostan is tangent on the other side. So also are the lines of Sumatra, the western coast of America, and the longer line of New Zealand. The western coast of Africa, he said, was no doubt fully parallel. There were other lines tangent to the tropics—the northern line of South America and the range of islands of the Pacific. This seemed to indicate that the sun had some influence in forming the lines of continents. The difference of temperature caused by the sun's rays was very considerable; enough, as we saw, to keep portions of the earth in a state of fluidity while others were solid. For a large portion of the year the sun was near one or the other of the tropics, and it might be expected to exhibit its power in this way by producing lines of cleavage, strongly tending to form the outlines of continents, for the instant the earth should shrink so far that the crust should be too large for it, then the flexure must take place along the lines of natural cleavage. Then the phenomena of freezing showed that there was a tendency to lines perpendicular to these, which would give lines nearly tangent to the tropics. One or the other of these lines would be the bottom of the ocean, and a corres-

ponding one the top of a continent. There would be no tendency to change, because the bottom of the ocean would keep cool from the superincumbent water, while the ridge of the continent would keep cool from its height, and the hottest places would be along the coast. We must expect these lines, therefore, to remain as a permanent condition, with only such modifications as would arise from currents and glacial action: a theory which geologists seemed inclined to adopt at present. He would draw attention to the effect which the trade winds produced by their friction upon the Pacific and Atlantic Oceans in gulf streams. The Gulf Streams, cotemporary with the first shaping of the American Continent, would throw warm water upon the European world and keep it in a fluid state for some time after the other continents were definitively formed. It was well known that the last portions of a fluid to freeze froze over most roughly; Europe, therefore, would be, as it was, the most broken up of the continents. Much criticism would arise from the known age-relations of different ranges of mountains. According to this view, we could hardly do otherwise than suppose that the first tendency to break should be along the line of the Pacific coast. Yet we know that this was one of the last to be upheaved. We must, however, remember that the first action was only a little flexure—just enough to give direction to a current which would afterwards throw the water over upon this side. This line, being the line of cleavage, would be the most subject to volcanic action, and would be the last as well as the first affected by it. The only ground of opposition to this was the theory of Elie de Beaumont, which traced long lines of wrinkling from very short lines of elevation in Europe. He thought that Elie de Beaumont had gone too far in making lines so short the bases of such extended generalization. It was very much like taking 600 or 700 miles of the Isthmus of Darien as a basis for determining the direction of the Andes and Rocky Mountains. We saw on examination that the lines of Elie de Beaumont were so close together, and so many of them were so nearly tangential to the polar circle, that we were led to believe that they might be only slight variations.

THE ZODIACAL LIGHT.—BY THE REV. GEORGE JONES, U.S.N.

The following brief notice conveys a very imperfect indication of the report submitted by the author, of his laborious and protracted observations.

Rev. Mr. Jones said, that after his former publication on the Zodiacal Light, he had felt the want of accurate and sufficient data, and determined to go to Quito, Ecuador, as the most eligible spot for his purpose. It was near the Equator and more free from clouds than most equatorial regions, and its elevation above the surface of the earth was productive of considerable transparency in the atmosphere. So great was this transparency that Humboldt had been able to see his friend, Bonnland, with the naked eye, at 17½ miles distance.

During June, July, and August, the sky at Quito was perfectly clear. But in June, Mr. Jones had been detained at Washington, and in July he and his assistant had the fever at Panama. His friend died on board the English steamer in Guayaguil River and two other persons also dying, he had been prevented from landing, and had to go to Payti, Peru. Thus he did not visit Quito till the end of August, when the sky had become less clear. During his eight months' stay he was only enabled to make 128 observations, but these were valuable. When clear the sky was surpassingly beautiful. The smaller stars were so visible that they

seemed to crowd the firmament, while the milky way seemed to have descended quite near the spectator. There he had seen the Zodiacal light, not only at the horizon as before, but forming a complete arch across the sky, extending from the eastern to the western horizon, and this, too, at every hour of the night. It was sometimes so bright as to look like another milky way, stretching across the heavens. He had brought back with him, he might state, some 115 plates exhibiting this luminous arch, giving its boundaries as seen among the stars and also the central line lengthwise. The brightness of the central portion was always greatest, diminishing towards the edges. He would also state that he had made drawings of the relative brightness of the various parts, and taken observations of luminosity as compared with the Milky Way.

Mr. Jones made the following deductions from his observations:—

First, That the substance giving out the Zodiacal Light formed a complete circle. Several of his observations carried it round in a single night, so as to form a complete circle, with the exception of a portion apparently near the sun. On the 26th and 27th December for instance, he had taken five observations. The first of these traced the light to within 16 degrees of the setting sun, the last to within 18 degrees of the rising sun; thus forming a complete circle with the exception of 36 degrees.

Secondly. It is a *great* circle in the heavens, forming an angle of 3 deg. 20 min. with the ecliptic, the ascending node being at longitude 62 deg., and that descending at longitude 242 deg. As seen from the earth, it has a width of about 28 deg.

Thirdly. It is a geocentric circle; for if it were heliocentric one portion would be much nearer the earth than that opposite, and consequently appear of much less breadth, which was not in accordance with the facts of the case. And again, if heliocentric, the laws of the reflection of light would require that the portions next the sun should reflect less light than those near the zenith of the spectator, these appearances were not visible. Again, that portion of the light near the horizon showed an affinity to the spectator's motions as he approached towards, or receded from the ring. And this could only happen in case of a body not very far off.

NOTICE OF THE LONGITUDE OF FERNANDINA, FLORIDA, BY CHRONOMETER EXCHANGES, FROM SAVANNAH, GEORGIA.—BY A. D. BACHE, SUPERINTENDENT, AND CHARLES A. SCHOTT, ASSISTANT, U. S. COAST SURVEY.

(*Abstract for the Canadian Journal, communicated by the Author.*)

The longitude of Fernandina was required in order to know the direction of the line across the peninsula of Florida to the Cedar Keys, which was in a general way to be followed by the triangulation, to connect the Atlantic and Gulf Coast work. Reconaissance had shown a triangulation to be practicable, connecting the termini of the air line rail road. The longitude of Savannah had been obtained by telegraph, and easy means existed for the transportation of chronometers between the two points.

The paper contains an account of the operations, and incidentally a discussion of personal equation, and of the performance of chronometers under different circumstances. The final difference of longitude is given, which is of the greatest importance, as the two best authorities differ some nine miles. The diagrams which accompany it show the order of succession of the chronometer trips, the

results of different trials with different observers for personal equation, and the comparison of the ratio of the observing chronometers with the changes of temperature.

From the observed changes of rate of all the chronometers compared with the changes of temperature, corrections were obtained by the method of least squares, and applied to the rate of each instrument so as to reduce them to a mean temperature rate.

The rates of the chronometers when stationary and travelling were deduced, the first by observations between the times of arrival and departure from the two stations, the second by considering the trips to and from Savannah and to and from Fernandina, and assuming equal travelling rates out and back. To these rates a correction was applied by the method of least squares, which, as was expected, turned out to be quite small. In determining this correction the hypothesis of equality of rates was dispensed with.

The two sets of chronometers each containing five instruments differing by nearly three-fourths of a second in the result for longitude, and consistently in the different trips, it was determined to transport them together so that they might be exposed to the same circumstances. This was done without any change of the results.

In deducing the final longitude weights were allowed according to the inverse ratios of the squares of the chronometer errors and also according to the duration of the trips.

The discussion gives 1 min. 29.76 for the difference of longitude of the stations at Savannah and at Fernandina, with a probable error of 0.06.

ON THE WINDS OF THE WESTERN COAST OF THE UNITED STATES, FROM OBSERVATIONS IN CONNECTION WITH THE COAST SURVEY.—BY A. D. BACHE, SUPERINTENDENT.

(*Abstract for the Canadian Journal, communicated by the Author.*)

The observations were made in connection with those of the tides in 1855 under supervision of Lieut., now Professor Trowbridge.

They are reduced by the methods stated in the paper on the winds of Cat Island in the Gulf of Mexico, and read before the Association in 1851.

The diagrams representing the winds for each month, for the half year and year, are plotted upon the compass rose, and show the quantities of wind. Others representing the hourly observations made each week are upon the ordinary rectangular system. They show better than any verbal descriptions, the whole of the phenomena of the winds at San Diego, San Francisco, and Astoria, during the year 1855.

The following simple generalizations are deduced:

1. The great prevalence of westerly winds representing a flow of air at the surface from the ocean in upon the land.

2. The general absence of easterly winds showing the absence of a return current at the surface. The proportion of westerly to easterly winds is as 8 to 1.

3. The increase of westerly winds in the summer, and their decrease in the winter.

4. When easterly winds blow at all, it is as a rule during the winter.

5. The N., N. E. and E. winds blow more frequently in the morning than in the evening hours.

6. The S. E. and S. W. winds are in general pretty equally distributed over the morning and evening hours.

7. The N. W. is the prevailing direction of the ordinary sea breeze at Astoria, and San Diego, and the W. at San Francisco.

Sometimes the W. wind has that character at the first named stations and sometimes the S. W. at the last named.

A close inspection of the same diagrams will lead to other interesting results.

Considering the quantities of wind at the three places for the whole year, (diagram No. 18,) San Diego and Astoria present remarkable similarities, there is more N. E., E and S wind at Astoria, and more N. W. wind at San Diego. At San Francisco the W. and S. W. winds give the character to the rose.

All show the same deficiency of easterly winds, and San Francisco is deficient also in southwardly ones.

The monthly curves grouped in two periods, from November to March, both included, and from April to October, show that the annual curve has the summer type impressed upon it.

The N. W. wind prevails in August at Astoria and San Diego, and the W. and S. W. at San Francisco.

There is scarcely any wind from points between North round by east and south. The form of the rose is exceedingly simple, and the generalization very obvious.

The N. E., E., S. and S. W. winds are considerable at Astoria, and the N. W. winds, give the prominent feature to the rose curve.

As the winter is not the windy season, so the months of March and September are not the windy months. The quantities in the several months and in the several directions are shown on Plate B. On the contrary, July is one of the windiest months of the year.

The further particulars deduced for each of the places of observation cannot be clearly followed without the diagrams.

ON THE HEIGHTS OF TIDES OF THE ATLANTIC COAST OF THE UNITED STATES, FROM OBSERVATIONS IN THE COAST SURVEY. BY A. D. BACHE, SUPERINTENDENT.

(*Abstract for the Canadian Journal, communicated by the Author.*)

The generalizations resulting from a study of the Coast Survey observations of the tides from Cape Florida to Portland are given in this paper, and are extended by the observations of Admiral Bayfield and Captain Shortland to the coasts of Nova Scotia and New Brunswick.

The coast is developed into a straight line, and the tidal stations plotted upon it with their actual distances from each other. At each station an ordinate is erected proportional to the height of the tide. The extremities of these ordinates are joined by a broken line, and a curve representing the general average of the change of heights is drawn across this line. A model in which vertical wires proportional to the rise and fall of the tides are inserted upon a map of the coast, at points corresponding to the tidal stations, shows clearly the law of change of heights.

In obtaining the curve of heights only the points corresponding to the tidal stations of the outer coast were joined; so, in the model, wires of different material represent the outer and inside tidal stations.

The least rise of tides is at Cape Florida, Cape Hatteras, and near the east end of Nantucket, the greatest at Tybee entrance, New York entrance, Boston and the Bay of Fundy stations.

The physical features of the coast clearly marked out are the great Southern Bay between Cape Florida and Cape Hatteras, the great Middle bay between Cape Hatteras and Nantucket, and the Eastern bay between Nantucket and Cape Sable, which itself may be part of the great Eastern bay between Nantucket and Newfoundland. This form of the coast, has, of course, not escaped the attention of geographers.

The tides are lowest at the entrance of these bays and rise as they pass into and up them.

Massachusetts bay is a dependency of the eastern bay, and so is Fundy. These interior bays, as also the sounds freely open to the sea along the, coast present the same features in their tides. Chesapeake bay, widening and changing direction from the entrance, is an exception to the rule. Nantucket and the Vinyard Sounds, Buzzard's bay, Narragansett bay, Long Island Sound, New York Bay, and Delaware Bay, come under the rule.

NOTES ON THE MEASUREMENT OF A BASE FOR THE PRIMARY TRIANGULATION OF THE EASTERN SECTION OF THE COAST OF THE UNITED STATES, ON EPPING PLAINS, MAINE. BY A. D. BACHE, SUPERINTENDENT OF THE U. S. COAST SURVEY.

(*Abstract for the Canadian Journal, communicated by the Author.*)

The reconnoissance for a base of verification at the eastern extremity of the primary triangulation in section I. of the coast was commenced by Chas. O'Boutelle, Esq., and Major Henry Prince, U. S. A., Assistants in the Coast Survey in 1853, and continued through 1854 and 55. The absence of long and straight beaches on this coast rendered it absolutely necessary to look for an interior site.

The reconnoissance resulted in the selection of Epping Plains, Penobscot Co., Me., as the most suitable site for the purpose, considering the character of the ground itself, and the facility of connecting the ends of the base with the primary triangulation.

In 1856 I examined the site and took steps to obtain the necessary estimate of the cost of preparing it for measurement. The profile of the road as graded gives a good general idea of the ground, as it varied but little from the natural profile.

The whole length of the line is about 8719 metres, or 5.4 miles. Its general direction is E 41° N (true bearing). From the eastern end for about 4 miles the plain is quite level, rising in the first mile pretty regularly about 15 feet, descending nearly as much in the second to rise by the same quantity in the third. It then runs along an elevated level for a fourth of a mile and descends gradually to the rougher part of the base which is included between the 3¾ miles from the east end and western end of the base.

This line was skilfully graded by Mr. Boutelle so as to follow the natural surface where the grades did not run above three degrees, and to give as long slopes as possible of the same grade for the convenience of measurement.

The graders partly consisted of the farmers and lumber men of the district, who served with great cheerfulness and skill in the use of the heavy implements for rough grading. One of the greatest difficulties was the removal of such boulders

as were in the line, many of them being of such size as to require blasting to break them up, and some being actually removed to the required distance from the line by heavy blasts.

The base apparatus already described before the association and described and figured in my report for 1854, by Lieut. E. B. Hunt, of the Corps of Engineers, was used in this measurement.

The measurement was begun at the west end of the line on Saturday, the 18th of July, but the next week proved so rainy that it was only resumed in earnest on Monday, 27th.

The work of the first Saturday (24 tubes) was measured on the following Monday with precisely the same result as to length, the end measurement falling precisely on the marks which had been placed as terminating the first. The mark was placed and verified as all others of the same sort in one measurement by a transit placed at right angles to the line and at a moderate distance from it.

This was a descending slope of the strongest grade adopted, and there was a difference of temperature of some five degrees in the two measurements. On Tuesday a length of 18 tubes which had been measured on Monday was re-measured with an identical result. This was on an ascending slope.

On Monday the work was in part interrupted by the arrangements for photographing the apparatus, on Tuesday by a fog, and on Wednesday by showers in the morning; we made, however, half a mile each day.

On Wednesday began a series of four unbroken days, during the first of which we measured ¾ of a mile, and on the three others a mile or more than a mile each day, reaching the east end of the Base on Monday evening.

Whole length of Base 28,607 feet, or about 5.4 miles.

Mean level of Base above mean tide 257 feet.

Approximate correction for reduction to the level of the sea 4 inches nearly.

No. of tubes inclined 647

" " level 810

Correction for versed sine for whole base, 9.2 feet to be subtracted.

Maximum inclination 8°14′

Greatest day's work 281 tubes, 1.05 miles, in 11h. 10m. working time, averaging 1 tube in 2m. 27s.

DEPOSITION OF NATIVE METALS IN VEIN FISSURES, &c., BY ELECTRO-CHEMICAL AGENCY.

BY PROF. E. J. CHAPMAN, OF UNIVERSITY COLLEGE, TORONTO.

From the known fact that solutions of various metallic salts may be decomposed by voltaic agency, and the metal obtained in the simple state, it has long been a favorite theory with many geologists, that depositions of native metals, in veins, &c., are due to a similar cause. That such may be a perfectly legitimate conclusion in many instances, I am quite ready to admit; but, in applying this view to any particular case, it is necessary, unless the explanation is to be regarded as a mere theory of convenience, that certain collateral circumstances be not altogether excluded from consideration. If these circumstances oppose themselves to our theory, and remain by it altogether unanswered; nay, if but a single well-proved fact withold its concurrence from the conditions demanded—surely it is more consistent with our obligations to scientific truth, that we abandon the theory at once—however plausible in itself, and however convenient in its application—rather

than attempt to maintain it by keeping these opposing conditions out of sight, or by wilfully ignoring their value. Now, my object in the present brief communication, is simply to bring before the notice of the Section, certain facts, experimental and otherwise, which appear to me to prove most incontestibly, that, in nine cases out of ten, the so-called electro-chemical theory as explanatory of the origin of native metals in veins, is entirely fallacious.

We will take the case of native copper, under its known conditions of occurrence in the Lake Superior District and other parts of North America. The electro-chemical theory is constantly being brought forward in explanation of this particular case. As the copper is here, normally, in intimate association with vast masses of erupted trap, it might naturally be inferred that the presence of both trap and copper was equally due to igneous action;* or, where the copper occurs in small strings and arborescent masses apart from the trap, to a modification of this action, in volatilization and subsequent reduction of chloride of copper or some other volatile compound. But the upholders of the electro-theory, find these views apparently too simple for their approval. It is very possible that the copper may have originated by some other agency; but the following facts will, I think, shew that this unknown agency was not the electro-chemical principle, whatever else it may have been. The copper is very constantly found in the interior of zeolites or calc-spar, or surrounding crystals of the latter substance in such a manner as to shew that the calc-spar was solid before the solidification of copper—the copper often presenting the most sharply-cut impressions, even to the minutest striæ of the crystals of the calcareous spar. I mention this well known condition of occurrence first, because it is commonly referred to as affording a strong proof of the deposition of the copper according to the electro-chemical theory, although nothing can really be more fatal to the reception of this hypothesis.

The conditions of occurrence just alluded to, may, in the estimation of some, disprove the igneous origin of the copper; but equally do these conditions disprove its origin according to the other view. In the first place, it must be remembered that the zeolites, and carbonate of lime also, are *non-conducting bodies;* and hence that no deposition of metal can be made to take place upon them, by the electro-chemical process, unless their surfaces be first coated with graphite or some other conducting substance. This may be readily shown by the simple method of ascertaining the conductibility or non-conductibility of mineral bodies, employed by Von-Kobell. The substance under examination is to be placed in a solution of sulphate of copper, and touched by a slip of zinc, or a piece of zinc bent into a kind of tongs may be used to hold the mineral. A deposition of metallic copper will rapidly take place upon conducting bodies, such as pyrites, galena, graphite, anthracite, &c., &c.; but not upon non-conductors, as quartz, the feldspars, garnet, calc-spar, malachite, and other similar minerals.

This fact, when forced upon the attention of those who maintain the electro-chemical theory, has been allowed to be "an objection;" but that is not the proper term. It is an insuperable obstacle—nothing less—to the legitimate adoption

*In support of this view, see Agassiz, "Lake Superior;" Dana, "Manual of Mineralogy;" Native Copper; Burat, "Geologie Appliquée;" Fournet, and other observers. It should also be remembered, in connection with this inquiry, that native copper occurs likewise in other truly erupted trap rocks of different ages and localities; as, for example, in Connecticut, New Jersey, Nova Scotia, Rhenish Prussia, the Faroe Isles, Barrhead in Scotland, and elsewhere. E. J. C.

of this theory,* and until it can be satisfactorily explained away, to attempt to account for the origin of the copper by reference to the principle in question, is surely, to say the least, a mere waste of words. A few other objections to this electro-chemical hypothesis may be briefly touched upon.

This hypothesis exacts necessarily a solution of the copper in some form or another. Now, some of the minerals associated with these copper deposits—carbonate of lime, for instance,—are readily altered by immersion in cupreous solutions; whereas the crystals of carbonate of lime actually occurring with the copper, as well as those met with in its immediate neighbourhood, exhibit no appearance of alteration, but retain, on the contrary, their white color and original surface condition. By placing these same crystals for a short time in a solution of sulphate of copper, they become converted at the surface into malachite, or into a copper carbonate of similar aspect, more especially if the solution be kept at a moderately elevated temperature.† Again, if the enormous deposits of Lake Superior originated in this manner, might we not reasonably look for the presence of vast secondary products, the results of the chemical decompositions which must necessarily have taken place. It is asking almost too much to assume that these secondary products may, from their solubility, or from other causes, have entirely disappeared, without leaving behind them very manifest traces of their former presence. But, yet again, if we assume this origin for the copper, we must necessarily assume also that the cupreous solution came from above: that is to say, from an *overlying*, not from an *underlying* source; as otherwise, from the filling up of the fissures, the supply would quickly have been cut off. This involves manifold difficulties of an easily imagined character.

My object, in the present note, is not to propose theories in explanation of the origin of these copper deposits, but simply to shew that if one of the hypotheses already advanced with this view—that which attributes the larger copper masses (in intimate association with the trap) to direct igneous action; and the smaller, arborescent and more distinct masses to gaseous emanations as previously explained—be not free from difficulty; the other, or so-called electro-chemical theory, is, in the cases referred to, absolutely untenable; and, amongst other reasons, chiefly for this, namely: that the deposition of the copper on non-conducting bodies is opposed to all known principles. It is to be hoped, therefore, that those who still feel inclined to adopt and maintain this theory of convenience, will not forget to enlighten us as to the cause of the peculiar departure from known laws exemplified in the cases under review.

THOUGHTS ON SPECIES.—BY JAMES D. DANA.

While direct investigation of individual objects in nature is the true method of ascertaining the laws and limits of species, we have another source of suggestion and authority in the comprehensive principles that pervade the universe. The source of doubt in this synthetic mode of reaching truth consists in our imperfect appreciation of universal law. But science has already searched deeply enough into the different departments of nature to harmonize many of the thoughts that are coming in from her wide limits; and it is well, as we go on in research, to compare the results of observations with these utterings of her universality.

* Specimens of Carbonate of Lime coloured and altered by this process were exhibited to the Section.

I propose to present some thoughts on species from the latter point of view, reasoning from central principles to the circumferential, and, if I mistake not, we shall find the light from this direction sufficiently clear to illumine a subject which is yet involved in doubts and difficulties.

The questions before us at this time are—

1. What is a species?
2. Are species permanent?
3. What is the basis of variations in species?

1. *What is a species?*

It is common to define a species as a *group* comprising such individuals as are alike in *fundamental* qualities; and then by way of elucidation, to explain what is meant by fundamental qualities. But the idea of a group is not essential; and moreover it tends to confuse the mind by bringing before it, in the outset, the endless diversities in individuals, and suggesting numberless questions that vary in answer for each kingdom, class or subordinate group. It is better to approach the subject from a profounder point of view, search for the true idea of distinction among species, and then proceed onward to a consideration of the system of variables.

Let us look first to *inorganic* nature. From the study of the inorganic world, we learn that each element is represented by a specific amount or law of force; and we even set down in numbers the precise value of this force as regards one of the deepest of its qualities, chemical attraction. Taking the lightest element as a unit to measure others by, as to their weights in combination, oxygen stands in our books as 8; and it is precisely of this numerical value in its compounds: each molecule is an 8 in its chemical force or law, or some simple multiple of it. In the same way there is a specific number at the basis of other qualities. Whenever then the oxygen amount and kind of force was concentrated in a molecule, in the act of creation, the species oxygen commenced to exist. And the making of many such molecules instead of one, was only a repetition in each molecule, of the idea of oxygen.

In combination of the elements, as of oxygen and hydrogen, the resultant molecule is still equivalent to a fixed amount, condition, or law, of chemical force; and this law, which we express in numbers, is at the basis of our notion of the new species.

It is not necessarily a different amount of force; for it may be simply a different state of concentration or different rate or law of action. This should be kept in mind in connection with what follows.

The essential idea of a species, thence deduced is this: a *species* corresponds to *a specific amount or condition of concentered force, defined in the act or law of creation.*

Turn now to the organic world. The individual is involved in the germ-cell from which it proceeds. That cell possesses certain inherent qualities or powers, bearing a definite relation to external nature, so that, when having its appropriate nidus or surrounding conditions, it will grow and develope out each organ and member to the completed result, and this, both as to all chemical changes, and the evolution of the structure which belongs to it as a subordinate to some kingdom, class, order, genus and species in nature. The germ-cell of an organic being developes a specific result; and like the molecule of oxygen, it must correspond to

a measured quota or specific law of force. We cannot apply the measure, as in the inorganic kingdom, for we have learned no method or unit of comparison. But it must nevertheless be true, that a specific predetermined amount, or condition, or law of force, is an equivalent of every germ-cell in the kingdoms of life. I do not mean to say that there is but one kind of force; but that whatever the kind or kinds, it has a numerical value or law, although human arithmetic may never give it expression.

A species among living beings, then, as well as inorganic, is based on *a specific amount or condition of concentered force defined in the act or law of creation.*

Any one species has its specific value, or law of force; another, its value; and so for all: and we perceive the fundamental notion of the distinction between species when we view them from this potential stand-point. The species, in any particular case, began its existence when the first germ-cell or individual was created; and if several germ-cells of equivalent force were created, or several individuals, each was but a repetition of the other; the species is in the potential nature of the individual, whether one or many individuals exist.

Now in organic beings,—unlike the inorganic,—there is a cycle of progress involving growth and decline. The oxygen molecule may be eternal as far as any thing in its nature goes. But the germ-cell is but an incipient state in a cycle of changes, and is not the same for two successive instants; and this cycle is such that it includes in its flow, a reproduction, after an interval, of a precise equivalent of the parent germ-cell. Thus an indefinite perpetuation of the germ-cell is in fact effected; yet it is not mere endless being, but like evolving like in an unlimited round. Hence, when individuals multiply from generation to generation, it is but a repetition of the primordial type-idea; and the true notion of the species is not in the resulting group but in the idea or potential element which is at the basis of every individual of the group; that is, the specific law of force, alike in all, upon which the power of each as an existence and agent in nature depends. Dr. Morton presented nearly the same idea when he described a species as a *primordial organic form.*

Having reached this idea as the starting point in our notion of a species, we must still, in order to complete and perfect our view, consider what is the true expression of this potentiality. For this purpose, we should have again in mind, that a living cell, unlike an organic molecule, has only an historical existence. The species is not the adult resultant of growth, nor the initial germ-cell, nor its condition at any other point; it comprises the whole history of the developement. Each species has its own special mode of developement as well as ultimate form or result, its serial unfolding, inworking and outflowing; so that the precise nature of the potentiality in each is expressed by the line of historical progress from the germ to the full expansion of its powers, and the realization of the end of its being. We comprehend the type-idea only when we understand the cycle of evolution through all its laws of progress, both as regards the living structure under developement within, and its successive relations to the external world.

2. *Permanence of species.*

What now may we infer with regard to the permanence or fixedness of species from a general survey of nature?

Let us turn again to the inorganic world. Do we there find oxygen blending by indefinite shadings with hydrogen or with any other element? Is its combining

number, its potential equivalent, a varying number,—usually 8, but at times 8 and a fraction, 9, and so on? Far from this the number is as fixed as the universe. There are no indefinite blendings of elements. There are combinations by multiples or sub-multiples but these prove the dominance and fixedness of the combining numbers.

But further than this, even numbers, definite in value and defiant of all destroying powers, are well known to characterize nature from its basement to its topstone. We find them in combinations by volume as well as weight, that is in all the relations of chemical attraction; in the mathematical forms of crystals and the simple ratios in their modifications,—evidence of a numerical basis to a cohesive attraction; in the laws of light heat, and sound. Indeed the whole constitution of inorganic nature, and of our minds with reference to nature, as Professor Peirce has well illustrated, involves fixed numbers; and the universe is not only based on mathematics, but on finite determinate numbers in the very natures of all its elemental forces. Thus the temple of nature is made, we may say, of hewn and measured stones, so that, although reaching to the heavens, we may measure and thus use the finite to rise toward the infinite.

This being true for inorganic nature, it is necessarily the law for all nature, for the ideas that pervade the universe are not ideas of contrariety but of unity and universality beneath and through diversity.

The units of the inorganic world, are the weighed elements and their definite compounds or their molecules. The units of the organic are *species* which exhibit themselves in their simplest condition in their germ-cell state. The kingdoms of life in all their magnificent proportions are made from these units. Were these units capable of blending with one another indefinitely, they would no longer be units, and species could not be recognized. The system of life would be a maze of complexities; and whatever its grandeur to a being that could comprehend the infinite, it would be unintelligible chaos to man. The very beauties that might charm the soul would tend to engender hopeless despair in the thoughtful mind instead of supplying his aspirations with eternal and ever-expanding truth. It would be to man the temple of nature fused over its whole surface and through its structure, without a line the mind could measure or comprehend.

Looking to facts in nature, we see accordingly every where, that the purity of species has been guarded with great precision. It strikes us naturally with wonder, that even in senseless plants, without the emotional repugnance of instinct, and with reproductive organs that are all outside, the free winds being often the means of transmission, there should be rigid law sustained against intermixture. The supposed cases of perpetuated fertile hybridity are so exceedingly few as almost to condemn themselves, as no true examples of an abnormity so abhorrent to the system. They violate a principle so essential to integrity of the plant-kingdom, and so opposed to nature's whole plan, that we rightly demand long and careful study before admitting the exception.

A few words will explain what is meant by perpetuated fertile hybridity. The following are the supposeable grades of results from intermixture between two species:—

1. No issue whatever—the usual case in nature.

2. Mules (naming thus the issue) that are wholly infertile whether among themselves or in case of connection with the pure or original stock.

3. Mules that are wholly infertile among themselves, but may have issue for a generation or two by connection with one of the original stock.

4. Mules that are wholly infertile among themselves, but may have issue through indefinite generations by connection for each with an individual of the original stock.

5. Mules that are fertile among themselves through one or two generations.

6. Mules that are fertile among themselves through an indefinite number of generations.

The cases 1 to 5 are known to be established facts in nature; and each bears its testimony to the grand law of purity and permanence. The examples under the heads 2 to 5 become severally less and less numerous, and art must generally use an unnatural play of forces or arrangements to bring them about.

Again, in the animal kingdom, there is the same aversion in nature to intermixture, and it is emotional as well as physical. The supposed cases of fertile hybridity are fewer than among plants.

Moreover, in both kingdoms, if hybridity be begun, nature commences at once to purify herself, as of an ulcer on the system. It is treated like a disease, and the energies of the species combine to throw it off. The short run of hybridity between the horse and the ass, species very closely related, reaching its end *in one single generation*, instead of favoring the idea that perpetuated fertile hybridity is possible, is a speaking protest against a principle that would ruin the system if allowed free scope.

The finiteness of nature in all her proportions, and in the necessity of finiteness and fixedness for the very existence of a kingdom of life, or of human science its impress on finite mind, are hence strong arguments for the belief that hybridity cannot seriously trifle with the true units of nature, and at the best can only make temporary variations.

It is fair to make the supposition that in case of a very close proximity of species, there might be a degree of fertile hybridity allowed; and that a closer and a closer affinity *might* give a longer and a longer range of fertility. But the case just now alluded to seems to cut the hypothesis short; and moreover it is not reasonable to attribute such indefiniteness to nature's outlines, for it is at variance with the spirit of her system.

Were such a case demonstrated by well established facts, it would necessarily be admitted; and I would add, that investigations directed to this point are the most important that modern science can undertake. But until proved by arguments better than those drawn from domesticated animals, we may plead the general principle against the *possibilities* on the other side. If there is a law to be discovered, it is a wide and comprehensive law, for such are all nature's principles. Nature will teach it not in one corner of her system only, but more or less in every part. We have therefore a right to ask for well defined facts, taken from the study of successive generations of the interbreeding of species known to be distinct.

Least of all should we expect that a law, which is so rigid among plants and the lower animals, should have its main exceptions in the highest class of the animal kingdom, and its most extravagant violations in the genus Homo; for if there are more than one species of Man, they have become in the main indefinite by intermixture. The very crown of the kingdom has been despoiled; for a kingdom in nature is perfect only as it retains all its original parts in their full symmetry, unde-

faced and unblurred. Man, by receiving a plastic body, in accordance with a law that species most capable of domestication should necessarily be most pliant, was fitted to take the whole earth as his dominion, and live under every zone. And surely it would have been a very clumsy method of accomplishing the same result, to have made him of many species, all admitting of indefinite or nearly indefinite hybridization, in direct opposition to a grand principle elsewhere recognized in the organic kingdoms. It would have been using a process that produces impotence or nothing among animals, for the perpetuation and progress of the human race.

There are other ways of accounting for the limited productiveness of the mulatto, without appealing to a distinction of species. There are causes, independent of mixture, which are making the Indian to melt away before the white man, the Sandwich Islander and all savage people to sink into the ground before the power and energy of higher intelligence. They disappear like plants beneath those of stronger root and growth, being depressed morally, intellectually and physically, contaminated by new vices, tainted variously by foreign disease, and dwindled in all their hopes, and aims, and means of progress, through an overshadowing race.

We have therefore reason to believe from man's fertile intermixture, that he is one in species; and that all organic species are divine appointments which cannot be obliterated, unless by annihilating the individuals representing the species.

It may be said, that different species in the inorganic world combine so as to form new units, and why may they not in the organic? It is true they combine, but not by indefinite blendings. There is a definite law of multiples, and this is the central idea in the system of inorganic nature. In organic nature, such a law of multiples, if existing, would be general, as in the inorganic; it would be an essential part of the system, and should be easily verified, while, in fact, observation lends it no support, not even enough to have suggested the hypothesis.

In one kingdom, the *inorganic*, there is multiplication of kinds of units by combination, according to the law of multiples, and no reproduction; while in the *organic*, there is reproduction of like from like and no multiplication of kinds by combination. And thus the two departments of living and dead nature widely diverge.

Neither does the possibitity of mere mixture among inorganic substances afford any analogy to sustain the idea of possible hybrid mixture indefinitely perpetuated among living beings. The mechanical aggregation of units that make up ordinary mixture, is one thing; and the combination that would alter a germ, one of the units in organic species, even to its fundamental nature, is quite another. This last is not aggregation. It is as different from mere mixture as is chemical combination, and stands somewhat in the same relation, so that the analogy has no bearing on the question.

3. *Variations of species.*

But there are variations in species, and this is our next topic. The principles already considered teach, as we believe, that each species has its specific value as a unit, which is essentially permanent or indestructible by any natural source of change; and we have, therefore, to admit in the outset, if these principles are true, that variations have their limits, and cannot extend to the obliteration of the fundamental characteristics of a species.

To understand these variations, we may again appeal to general truths.

Variation is a characteristic of all things finite; and is involved in the very

conditions of existence. No substance or body can be wholly independent of every or any other body in the universe. The most comprehensive and influential law in nature, most fundamental in all change, composition or decomposition, growth or decay, is the law of mutual sympathy, or tendency to equilibrium in force through universal action and reaction.

The planets have their orbits modified by other bodies in space through their changing relation to those bodies. A substance, as oxygen or iron, varies in temperature and state of expansion from the presence of a body of different temperature; in chemical tendencies from the presence of a luminous body like the sun; in magnetic or electrical attraction from surrounding magnetic or electrical influences. There is thus unceasing flow and unceasing change through the universe. All the natural forces are closely related as if a common family or group, and are in constant mutual interplay.

The degree or kind of variation has its specific law for each element; and in this law the specific nature of the element is in a degree expressed. There is to each body or species the normal or fundamental force in which its very nature consists; and in addition, the relation of this force to other bodies, or kinds, amounts or conditions of force, upon which its variations depend. One great end of inorganic science is to study out the law of variables for each element or species. For this law is as much a part of an idea of the species as the fundamental potentiality; indeed the one is a measure of the other.

So again, a species in the *organic* kingdoms is subject to variations, and upon the same principle. Its very development depends on the appropriation of material around it, and on attending physical forces or conditions, all of which are variable through the whole of its history. Every chemical or molecular law in the universe is concerned in the growth,—the laws of heat, light, electricity, cohesion, &c.; and the progress of the developing germ, whatever its primal potentiality, is unavoidably subject to variation, from the diversified influences to which it may be exposed. The new germ, moreover, takes peculiarities from the parent, or from the circumstances to which its ancestry had been exposed during one or more preceding generations.

There is then a fixed normal condition or value, and around it librations take place. There is a central or intrinsic law which prevents a species being drawn off to its destruction by any external agency, while subject to greater or less variations under extrinsic forces.

Liability to variation is hence part of the law of a species; and we cannot be said to comprehend in any case the complete idea of the type until the relations to external forces are also known. The law of variables is as much an expression of the fundamental equalities of the species in organic as in inorganic nature; and it should be the great aim of science to investigate it for every species. It is a source of knowledge which will yet give us a deep insight into the fundamental laws of life. Variations are not to be arranged under the head of *accidents:* for there is nothing accidental in nature; what we so call, are expressions really of profound law, and often betray truth and law which we should otherwise never suspect.

This process of variation is the external revealing the internal, through their sympathetic relations; it is the law of universal nature reacting on the law of a special nature, and compelling the latter to exhibit its qualities; it is a centre of

force manifesting its potentiality, not in its own inner working, but in its outgoings among the equibrating forces around, and thus offering us, through the known and physical, some measure of the vital within the germ. It is therefore one of the richest sources of truth open to our search.

The limits of variation it may be difficult to define among species that have close relations. But being sure that there are limits—that science, in looking for law and order written out in legible characters, is not in fruitless search, we need not despair of discovering them. The zoologist, gathering shells or mollusks from the coast of eastern America and that of Japan, after careful study, makes out his lists of identical species, with the full assurance that species are definite and stable existences; and he is even surprised with the identity of characters between the individuals of a species gathered from so remote localities. And as he sees zoological geography rising into one of the grandest of the sciences, his faith in species becomes identified with his faith in nature and all physical truth.

If then we may trust this argument from general truths to special,—general *truths* I say, for general principles as far as established are truths—we should conceive of a species from the potential point of view, and regard it as—

a. A concentrated unit of force, an ineffaceable component of the system of nature; but

b. Subject to greater or less librations, according to the universal law of mutual reaction or sympathy among forces.

And, in addition, in the *organic* kingdom,

c. Exhibiting its potentiality not simply or wholly in any existing condition or action, but through a cycle of growth from the primal germ to maturity, when the new germ comes forth as a repetition of the first to go another round in the cycle and perpetuate the original unit; and, therefore, as follows from a necessary perpetuity of the cycle—

d. Exhibiting identity of species among individuals by perpetuated fertile intermixture in all normal conditions, and nonidentity by the impossibility of such intermixture, the rare cases of continuations for one or two generations, attesting to the stability of the law, by proving the effort of nature to rid herself of the abnormity, and her success in the effort.

e. The many like individuals that are conspecific do not properly constitute the species, but each is an expression of the species in its potentiality under some one phase of its variables; and to understand a species, we must know its law through all its cycle of growth, and its complete series of librations.

We should therefore conceive of the system of nature as involving, in its idea, a system of units, finite constituents at the basis of all things, each fixed in law; these units in organic nature as adding to their kinds by combinations in definite propositions; and those in organic nature adding to their numbers of representative individuals, but *not* kinds, by self-reproduction; and all adding to their varieties by mutual reaction or sympathy. Thus from the law within and the law without, under the Being above as the Author and sustainer of all law, the world has its diversity, the Cosmos its fullness of beauty.

I would remark again that we must consider this mode of reaching truth, by reasoning from the general to the special, as requiring also its complement, direct observation to give unwavering confidence to the mind; and we should therefore encourage research with a willingness to receive whatever results come from

nature. We should give a high place in our estimate to all investigation tending to elucidate the variation or permanence of species, their mutability or immutability; and at the same time, in order that appearances may not deceive us, we should glance towards other departments of nature, remembering that all truth is harmonious, and comprehensive law the end of science.

A word further upon our conception of species as realities. In acquiring the first idea of species, we pass, by induction, as in other cases of generalization, from the special details displayed among individuals to a general notion of a unity of type; and this general notion, when written out in words, we may take as an approximate formula of the species. One system of philosophy thence argues that this result of induction is nothing but a notion of the mind, and that species are but an imaginary product of logic; or at least, that since, as they say, (we do not now discuss this point), genera are groupings without definite limits which may be laid off variously by different minds, so species are undefined, and individuals are the only realities—the supposed limits to species being regarded as proof of partial study, or a consequence of a partial development of the kingdoms of nature. Another system infers, on the contrary, that species are realities, and the general or type idea has, in some sense, a real existence. A third admits that species are essentially realities in nature, but claims that the general idea exists only as a result of logical induction.

The discussion in the preceding pages sustains most nearly the last view, that species are realities in the system of nature while manifest to us only in individuals; that is, they are so far real, that the idea for each is definite, even of mathematical strictness, (although not thus precise in our limited view,) it proceeding from the mathematical and infinite basis of nature. They are the units fixed in the plan of creation; and individuals are the material expressions of those ideal units.

At the same time we learn, that while species are realities in a most important and fundamental sense, no comprehensive type-idea of a species can be represented in any material or immaterial existence. For while a species has its constants, it has also its variables, each variable becoming a constant so far only as its law and limits of variation are fixed; and in the organic kingdoms, moreover, each individual has its historic phases, from the germ through the cycle of growth. The general idea sought out by induction, therefore, is not made up of invariables. Limited to these, it represents no object, class of objects, or law, in nature. The variables are a necessary complement to the invariables; and the complete species idea is present to the mind, only when the image in view is seen to be ever changing along the lines of variables and developement. Whatever indidualized conception is entertained, it is evidently a conception of the species in one of its phases,—that is, under some one specific conditon as to size, form, color, constitution, &c., as regards each part in the structure, from among the many variations in all these respects that are possible: mind can picture to itself individuals only and not species, and one phase at a time in the life of an organic individual, not the whole cycle.

We may attempt to reach what is called the typical form of a species, in order to make this the subject of a conception. But even within the closest range of what may be taken as typical characters, there are still variables; and moreover, we repeat it, no one form, typical though we consider it, can be a full expression of the species, as long as variables are such an essential part of its idea as constants

The advantage of fixing upon some one variety as the typical form of a species is this,—that the mind may have an initial term for the laws embraced under the idea of the species, or an assumed centre of radiation for its variant series, so as more easily to comprehend those laws.

Again, abrupt transitions and not indefinite shadings have been shown to be the law of nature. In proceeding from special characters to a general species-idea, nature gives us help through her stepping stones and barriers. In former times, man looked at iron and other metals from the outside only, and searching out their differences of sensible characters, gradually eliminated the general notion of each, by the ordinary logical method of generalization. But science now brings the element to the line and plummet, and reaches a fixed *number* for iron and other elements as to chemical combination, etc. By this means, the studying out of the idea of a species seems almost to have escaped from the domain of logic into that of direct trial by weights and measures. It is no longer the undefined progress of simple reason, with a mere notion at the end, but an appeal to definite measurable values, with stable numbers at bottom, fixed in the very foundations of the universe. So, in the organic kingdoms, where there is, to our limited minds, still greater indefiniteness in most characters, the barrier against hybridity appears to stand as a physical test of species. We are thus enabled in searching into the nature of a species, to strike from the outside detail to the foundation law.

The type-idea, as it presents itself to the mind, is no more a subject of defined conception than any mathematical expression. Could we put in mathematical terms the precise law, in all its comprehensiveness, which is at the basis of the species iron, as we can for one of its qualities, that of chemical attraction, this mathematical expression would stand as a representative of the species; and we might use it in calculations, precisely as we can use any mathematical term. So also, if we could write out in numbers the potential nature of an organic species, or of its germ, including the laws of its variables, this expression would be like any other term in the hands of a mathematician; the mind would receive the formula as an expression for the species, and might compare it with the formulas of other species. But, after all, we have here a mere mathemathical abstraction, a symbol for amount or law of force, which can be turned into conceptions, only by imagining (supposing this possible) the force in the course of its evolution of concrete realities, according to the law of development and laws of variations embraced within it.

NEWER PLIOCENE FOSSILS OF THE ST. LAWRENCE VALLEY.—BY PROFESSOR DAWSON.

The object of this paper was in the first place to notice several fossil shells recently found by the author and others in these deposits, and which did not appear to have been previously observed. The species mentioned were:

Natica Heros, Say	Beauport.
Natica Grœnlandica, Beck	do.
Fusus tornatus, Gould.	Montreal.
Fusus harpularius, Couthoy	
Rissoa minuta	Montreal.
Turritella, (like *erosa*)	Beauport.

Bulla oryza, Tott .... Montreal.
Spirorbis sinistrorsu, Montague .... do.
Univalve, (perhaps *Menestho albula*) ....

Most of these are shells now living on the Atlantic coast of America, north of Cape Cod, and some of them ranging very far north. The paper then referred to the distribution of the various kinds of drift in the vicinity of Montreal, and to the conditions of the sea areas, in which the shells and other marine animals of the Newer Pliocene period existed in the St. Lawrence Valley. Good evidence exists of a sea beach on Montreal Mountain, at an elevation of 470 feet above the sea. The sea area corresponding to this beach must have extended to the Laurentide hills and the escarpment of Niagara, and communicated freely with the ocean on the east. On the other hand there are lower shores of the same period only 100 feet above the St. Lawrence. These must have belonged to a very narrow prolongation of the present Gulf of St. Lawrence.

The conditions of climate, ice, drift, &c., corresponding to these different shores must have been very diverse.

Again, in the stratified drift, it is possible to recognise, within a few inches of each other, a bed containing deep-sea shells, and another containing species that are littoral; these sea bottoms corresponding to different levels of the land. It is evident that any conclusions with reference to the climate indicated by the marine fauna of these successive beds of marine detritus, must take into account these fluctuations of the sea level, and the changes in animal life consequent on them. Taking these into account, positive and reliable results may be attained; and the study of such districts as the St. Lawrence valley may be made to contribute toward the elucidation of the conditions of life in older formations.

NORTH AMERICAN LAKES.—BY MR. CHARLES WHITTLESEY.

The fluctuations of level of the American lakes, have repeatedly formed a subject of inquiry, and have been brought under the notice of the Canadian Institute, by Major Lachlan, in former years. These fluctuations present three distinct features. There was first the general rise and fall, extending through a long period of time; then the annual rise and fall occurring regularly within a certain period of each year, which Mr. Whittlesey styled the annual fluctuation; then there was the third, a local, fitful, and irregular oscillation, lasting sometimes from three to five minutes, and varying in duration from one to twenty-four hours. He had no difficulty in explaining the general rise and fall of the lakes, as they were merely the reservoirs for the drainage of the country of the surplus water, which passes thence by the St. Lawrence as a general opening to the sea. Mr. Whittlesey read a variety of statistics in reference to the range and extent of the two first named fluctuations, and said he was unable to find in these, or in the examinations he had made, any confirmation of the popular belief that there is a seven years rise and fall of waterin the Lakes. He then directed attention to the cause of the third phenomenon—the irregular fluctuations which occur without any particular known cause. Although these pulsations, as they might be termed, were the first to attract notice, they were the last to have received any explanation. They occur in

all conditions of the atmosphere, but whether produced by electro-magnetic influence or not he could not say, although he thought it not unphilosophic to look in that direction for their cause.

DIRECTION OF THE CURRENTS OF DEPOSITION AND SOURCE OF THE MATERIALS OF THE OLDER PALÆOZOIC ROCKS.—BY PROF. JAMES HALL.

In treating of the elevation of mountains, the author remarked, sufficient consideration had not been given to the distribution of the material forming these mountain chains, in its unaltered condition. All the materials they knew of were stratified, and had been metamorphosed more or less. He proposed to occupy a few moments in following the direction of the ancient currents, and to show their parallelism with the mountain chains in the Laurentian Mountains, north-east of them, which are nearly parallel to the Appalachian chain. The Geological Survey would show whether these sediments were thicker to the eastward than to the westward; but he thought the direction of the currents which deposited the materials forming the Appalachian chain, was from the north-east. They had certainly good evidence, from the fact that the strata are of the same age, and are much thicker from the north-easterly direction then from the south-west. They gradually thin in that direction, and as he believed they were deposited by water, the further from the source they would be the thinner. They had reason to believe that in the south-west these strata were much thinner than in the north. Taking the Hudson River group which consists of sediments stretching to the south-west, with a thickness of 1000 feet to the north-east of us, it thins down to 600 feet in Pennsylvania, and finally in the Mississippi valley the thickness is not more than 100 feet. Passing from the Hudson river group and over a lapse of time, to the Oriskany Sandstone we find the deposits from the north-east.

At Gaspé the thickness is 7000 feet, in New York it is reduced to a few hundred feet, and the strata thin out in a westerly direction. The conclusion he had arrived at was that along these lines of deposit where the greatest accumulation of sediment has been made, is where we have the greatest elevation of mountain chains. This merely coincides with the direction of the ancient currents, and the Appalachian mountain range has not been more uplifted than the other portions of the country, or than the plain between these and the Atlantic. In New York and Pennsylvania we get to the Potsdam Sandstone, and, therefore, there was no uplifting of any previously existing rocks before the Appalachian chain. The folding and plication had commenced at an early period—at a period before the upper Silurian Rocks were formed, and we find these strata plicated, and uplifted and metamorphosed in a considerable degree. We get no lower than the Potsdam Sandstone in any part of the Appalachian chain, and we can demonstrate that no lower mass has had anything to do in giving us the elevation of this mountain chain. The Professor then referred to his examination into other formations in confirmation of his hypothesis that elevating forces had not caused the uplifting of these mountain chains. On the contrary, if there had been no folding and plication, this range of mountains, he thought, would have been twice as high as they now are.

CLASSIFICATION OF THE HUMAN RACE.—BY THE REV. PROF. ANDERSON, OF ROCHESTER.

This subject was introduced to the notice of the Section with a view of shewing the importance of some comprehensible classification of the varieties of the human race, in order to the correct observation of those facts upon which one school of ethnologists founded their opinion that mankind consisted of several species, or of one species planted in several centres of creation. To illustrate the difficulties in the way of classification, Prof. Anderson mentioned that Virēy divided the race into two species—the white and the yellow; the black and the brown. But many difficulties interfere with the classification. Take, for instance, the Arabians—the purest of the Semitic races—and he found the Arab in one place with light hair and blue eyes, while in the hot regions of the desert the Arab very nearly approached the Negro. The same changes occurred in the Hindoos and great Iranian races, as they descended from the mountains to the hot deltas of the rivers and to the sea coast. This was also to be remarked in Africa; so that the distinction into white and yellow, black and brown, formed no really useful classification. Jacquenot spoke of three species of men; Dumoulin of eleven, of which the first was the Celto-Scyth Arab, the meaning of which he could not divine. Colonel St. Vincent made eleven species; and Luke Burke, the editor of the *Ethnologist*, made sixty-three; while Dr. Morton's posthumous works made twenty families, each of which he plainly looked on as a distinct species. These could not all be right. Again, Agassiz considered that there were at least eight, and perhaps a thousand centres of creation, though there was but one species; but there were many difficulties about that theory, as it would require a new miracle of creation for each supposed centre; and it was a good rule in physics not to allow new creations except where they were absolutely required. He concluded by saying that he thought the proper attitude for Ethnologists at present was to hold all theories as provisional, keeping themselves ready to give an unprejudiced consideration to new facts whenever they appeared.

ON THE BREAKS IN THE SUCCESSION OF LIFE IN THE BRITISH ROCKS.—BY PROF. A. C. RAMSAY.

Professor Ramsay, of the Geological Survey of Great Britain, who attended the meeting as the representative of the London Geological Society, described the physical breaks, and the breaks in the succession of life, which appear to be established by the palæontological study of the British rocks. In illustration he exhibited a chart to show the fossiliferous strata of Great Britain in their chronological order, and the number of genera and species of fossils found in each, as well as the number which pass from one series to the next above. He then discussed the probable causes at work to produce the phenomena under consideration, and expressed his belief that the extinction of the animal and vegetable species of fossils was owing to physical changes similar to those which are constantly in operation at the present time.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST—OCTOBER, 1857.

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 min. 33 sec. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°. 6 A.M.	2 P.M.	10 P.M.	MEAN	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	ME'N	Mean Temp. + or − of the Average	Tens. of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Resultant Direction.	Velocity of Wind. 6 A.M.	2 P.M.	10 P.M.	Result't.	ME'N	Rain in Inches.	Snow in Inches.
					°	°	°	°	°												°							
1	29.671	29.591	29.677	29.6500	41.6	49.8	43.7	46.47	− 3.95	.216	.314	.284	.273	.83	.89	.90	.87	W N W	N E b E	N E b N	N 42 E	2.0	4.2	5.3	3.93	5.04	0.080	...
2	.804	.832	.914	.8750	40.0	50.7	42.9	43.98	− 5.95	.181	.191	.166	.175	.74	.52	.61	.62	N E	E b S	N E b N	N 49 E	6.3	6.2	7.5	5.77	6.28	......	...
3	.919	.941	.946	.9172	38.9	50.5	50.9	47.17	− 2.33	.233	.278	.320	.266	.87	.78	.87	.82	N E b N	N E b E	N E N	N 64 E	4.2	4.5	3.0	2.97	3.09	......	...
4	.949	.888	—	—	51.4	55.2	—	—	—	.334	.368	—	—	.89	.86	—	—	N E b E	Calm.	Calm.	N 81 E	1.2	0.0	0.0	1.32	1.38	......	...
5	.907	.864	.802	.8548	51.8	59.6	49.8	53.03	+ 4.42	.354	.408	.312	.349	.93	.82	.89	.87	Calm.	S b E	Calm.	S 25 E	0.0	5.2	0.0	0.79	0.90	......	...
6	.767	.726	.738	.7407	50.1	63.5	48.7	54.20	+ 5.98	.320	.387	.289	.340	.90	.70	.83	.84	Calm.	N W b N	N N W	N 29 W	0.0	12.3	0.8	6.49	6.53	......	...
7	.769	.766	.697	.7392	42.2	55.6	44.3	48.47	+ 0.62	.250	.325	.239	.274	.86	.76	.83	.82	N N W	S b W	Calm.	S 16 W	7.3	5.5	0.0	1.27	2.46	......	...
8	.692	.626	.618	.6438	48.9	62.2	52.3	52.43	+ 4.98	.211	.342	.343	.311	.90	.63	.89	.81	S	S S W	N N W	S 51 W	1.0	8.5	0.5	1.79	2.62	......	...
9	.686	.718	.768	.7323	51.6	59.0	51.4	54.42	+ 7.35	.344	.382	.334	.354	.91	.78	.80	.85	N b W	Calm.	Calm.	N 52 E	0.5	0.0	0.0	1.33	1.36	......	...
10	.848	.751	.829	.8112	45.8	54.8	48.7	49.97	+ 3.30	.206	.286	.298	.268	.68	.68	.88	.76	N E	E b N	N E	N 72 E	5.5	11.0	4.8	5.90	6.09	......	...
11	.823	.768	—	—	44.0	57.0	—	—	—	.268	.232	—	—	.94	.51	—	—	E N E	E S E	N E b E	N 85 E	1.2	6.2	1.0	3.40	3.97	......	...
12	.688	.662	.731	.6918	50.9	59.9	58.4	57.03	+11.07	.320	.447	.439	.411	.87	.88	.92	.89	E b N	S S W	Calm.	S 11 W	5.2	15.2	0.0	2.43	3.79	0.385	...
13	.736	.751	.788	.7658	56.0	61.0	50.9	55.55	+ 9.97	.391	.376	.301	.353	.89	.72	.82	.81	N N W	E S E	E b S	N 27 E	9.0	3.0	6.5	2.72	4.23	0.010	...
14	.780	.714	.667	.7143	42.2	57.0	49.1	50.47	+ 5.20	.247	.320	.287	.277	.93	.70	.78	.77	N b E	E S E	E S E	N 81 E	1.7	3.0	1.2	3.47	4.13	.....	...
15	.544	.425	.308	.4138	50.1	51.6	49.5	50.63	+ 5.78	.361	.345	.243	.294	.85	.91	.69	.81	N	N N W	N	N 3 W	0.0	5.8	6.2	6.28	6.49	Inap	...
16	.289	.336	.471	.3743	45.8	51.0	41.8	46.18	+ 1.65	.227	.246	.171	.211	.75	.67	.64	.68	N b W	N W b N	N W b N	N 30 W	13.4	17.0	11.8	10.67	10.96	......	...
17	.641	.592	.664	.6462	32.3	52.5	48.0	45.05	+ 0.80	.153	.216	.228	.204	.83	.56	.69	.69	N W b W	S S W	W b N	S 61 W	0.5	14.8	7.0	5.38	6.26	......	...
18	.924	.954	—	—	36.4	49.1	—	—	—	.178	.293	—	—	.81	.85	—	—	W	S b W	S E b S	S 29 W	2.2	6.2	0.8	2.50	4.96	0.240	...
19	.540	.423	.453	.4663	49.0	51.6	39.7	46.32	+ 2.53	.313	.236	.185	.236	.92	.63	.77	.74	S W b S	W	W b N	S 86 W	5.4	12.6	16.0	13.11	13.89	0.055	...
20	.540	.712	.865	.7263	32.1	38.6	31.0	32.82	−10.75	.105	.117	.144	.122	.57	.49	.82	.66	W b N	N W b W	W b N	N 61 W	23.6	34.0	5.0	16.71	17.04	......	...
21	.863	.856	.946	.8925	29.5	44.6	31.6	35.60	− 7.65	.135	.134	.146	.143	.95	.46	.81	.71	W	W b N	W b N	N 75 W	2.2	14.7	1.5	6.55	6.61	......	...
22	.986	.940	.883	.9330	28.8	46.3	39.3	38.42	− 4.55	.140	.208	.214	.192	.88	.67	.90	.82	W b N	E b S	N E	N 79 E	3.5	6.4	4.0	2.59	4.10	......	...
23	.851	.817	.818	.8246	40.0	50.2	38.9	43.50	+ 0.75	.205	.273	.212	.236	.84	.76	.91	.85	N E	S b E	Calm.	S 37 E	1.6	9.0	0.0	2.60	3.59	.....	...
24	.741	.609	.493	.6078	43.3	49.1	46.5	46.35	+ 3.85	.254	.293	.304	.288	.92	.86	.97	.91	N E	E	N E b E	N 63 E	5.8	5.8	3.7	4.30	4.44	0.235	...
25	.407	.419	—	—	47.3	49.1	—	—	—	.301	.309	—	—	.93	.90	—	—	E N E	N b W	N b W	N 11 W	2.6	6.2	18.3	13.08	13.60	0.020	...
26	.500	.422	.482	.4778	39.7	46.5	36.1	39.77	− 2.22	.202	.166	.120	.160	.83	.53	.57	.66	N N W	N b W	N b W	N 14 W	27.0	34.6	32.6	27.03	27.08	......	...
27	.568	.562	.587	.5773	30.3	42.8	40.0	37.67	− 4.12	.114	.143	.133	.128	.67	.52	.54	.57	N N W	N b W	N N W	N 25 W	14.0	8.8	6.5	6.78	9.88	......	...
28	.563	.510	.530	.5387	36.8	39.3	33.9	36.13	− 5.35	.124	.139	.170	.150	.57	.58	.88	.72	N	E	N E	N 51 E	4.0	2.8	3.3	3.33	3.70	......	0.2
29	.474	.433	.440	.4518	34.1	37.9	37.1	36.47	− 4.80	.173	.188	.192	.183	.89	.82	.87	.85	N E b N	N E	Calm.	N 36 E	2.0	0.2	0.0	1.61	1.62	......	Inap
30	.432	.418	.459	.4380	31.7	44.3	39.7	38.15	− 2.80	.160	.199	.163	.182	.90	.69	.67	.79	N N E	S	Calm.	S 84 W	2.6	1.2	0.0	0.64	1.97	Inap	...
31	.454	.481	.538	.4958	39.1	45.1	37.6	40.20	− 0.55	.217	.229	.168	.192	.92	.76	.75	.78	S E b S	S S W	W	S 88 W	1.4	0.0	5.5	3.59	5.18	0.015	...
M	29.6771	29.6473	29.6708	29.6671	41.21	50.93	43.88	45.49	+ 0.38	.225	.267	.236	.243	.84	.70	.80	.78	......	......	......	......	5.38	8.84	4.93	...	6.24	1.040	0.2

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR OCTOBER, 1857.

Highest Barometer	29.994 at 8 a.m. on 22nd	Monthly range= 0.705 inches.
Lowest Barometer	29.289 at 6 a.m. on 16th	
Self-registering Ther. — Maximum temperature	64°0 on p. m. of 6th	Monthly range= 37°5
Minimum temperature	26.5 on a. m. of 21st	
Mean maximum temperature . .	51°93	Mean daily range = 14°45
Mean minimum temperature . .	37°47	
Greatest daily range	26°2 from a. m. to p. m. of 8th.	
Least daily range	7.0 from p. m. of 4th to a. m. of 5th.	
Warmest day . . 12th ... Mean Temperature . . .	57.03	Difference=24°21.
Coldest day . . . . 20th ... Mean Temperature . . .	32°82	
Maximum. Solar	80°0 on p. m. of 13th	Monthly range= 62°6
Radiation. Terrestrial	17.4 on a. m. of 21st	

Aurora observed on 2 nights, viz.: on 17th and 23rd; possible to see Aurora on 13th night; impossible on 18th night.

Snowing on 2 days; depth, 0.2 inches; duration of fall 11.0 hours.
Raining on 10 days; depth, 1.040 inches; duration of fall, 42.0 hours.

Mean of cloudiness=0.62; most cloudy hour observed, 6 a. m., mean=0.66: least cloudy hour observed, midnight; mean=0.54.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
2570.76	512.76	1006.69	1718.43

Resultant direction of the wind, N 19° W; Resultant Velocity, 2.93 miles per hour.

Mean velocity of the wind 6.24 miles per hour.
Maximum velocity . . . 44.2 miles per hour, from 10 to 11 a. m. on 20th.

Most windy day . . . . 28th—Mean velocity, 27.08 miles per hour.
Least windy day . . . . 5th—Mean velocity, 0.99 do

Most windy hour 1 to 2 p.m.—Mean velocity, 8.94 do } Difference
Least windy hour 9 to 10 p.m.—Mean velocity, 4.43 do } 4.51 miles.

2nd. Halo round the moon at 10 p. m. 5th. Halo round the moon at 9 p. m. 5th. Corona round the moon at midgt. 12th. Sheet-lightning in S W, 8 to 9 p. m. 14th. Halo round the sun at 4 p. m. Very perfect. 15th. Large meteor, course from zenith towards E, at 7 h. 55 m., p. m. 17th. Thin ice at 6 a. m.—the first observed this season. 17th. Sheet-lightning during the evening. 20th, 21st and 22nd. Thin ice on the pools at 6 a. m. 21st. Shooting stars numerous during the night. 28th. Slight snow from 2 to 9 p. m. First of the season.

The barometer and the temperature through the month exhibit no remarkable fluctuations.

Rain.—There was a considerable deficiency in the rain, its amount being less than half that which usually falls in October.

Wind.—The resultant direction and velocity for October, from 1848 to 1857, inclusive, were N 55° W, 1.44 miles.

The 28th was the most windy day but one ever recorded, its mean velocity being exceeded only on the 14th Dec., 1853, when it amounted to 28.06 miles per hour. From the 28th at midnight to the following midnight the average was 29.62 miles, thus surpassing any velocity yet recorded for 24 consecutive hours.

COMPARATIVE TABLE FOR OCTOBER.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Difference from Average.	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant Direction.	Resultant Velocity.	Mean Velocity
1840	44.4	— 0.8	68.5	23.9	44.6	13	1.860	3	Not Recor	—	—	—
1841	41.6	— 3.6	58.3	20.3	38.0	6	1.360	2		—	—	0.41 lbs
1842	45.1	— 0.1	68.5	30.0	38.5	8	5.175	...		—	—	0.35 "
1843	41.8	— 3.4	65.7	24.5	41.2	12	3.790	4	2.5	—	—	0.54 "
1844	43.3	— 1.9	69.6	17.8	51.8	7	imp.	4	12.0	—	—	0.43 "
1845	46.4	+ 1.2	62.7	20.0	42.7	11	1.760	1	inap.	—	—	0.26 "
1846	44.6	— 0.6	69.7	20.7	49.0	14	4.180	2	inap.	—	—	0.44 "
1847	44.0	— 1.2	65.0	20.3	44.7	13	4.390	2	inap.	—	—	0.19 "
1848	46.3	+ 1.1	62.2	26.4	35.8	11	1.550	...	...	N 54 W	1.24	4.60 mls
1849	45.3	+ 0.1	59.2	25.5	33.7	13	5.965	1	inap.	N 12 W	1.27	4.76 "
1850	45.4	+ 0.2	66.6	24.8	41.8	10	2.085	...	...	N 66 W	1.10	5.30 "
1851	47.4	+ 2.2	66.1	25.0	41.1	10	1.680	2	0.3	S 72 W	1.06	4.39 "
1852	48.0	+ 2.8	70.7	29.8	40.9	12	5.280	...	...	N 5 E	1.19	4.47 "
1853	44.4	— 0.8	64.7	25.5	39.2	10	0.875	2	inap.	S 88 W	1.78	4.72 "
1854	49.5	+ 4.3	74.2	29.8	41.4	15	1.495	3	inap.	N 25 E	1.20	4.60 "
1855	45.4	+ 0.2	64.3	28.0	36.3	14	2.485	5	0.8	N 82 W	4.91	9.88 "
1856	45.3	+ 0.1	70.1	23.3	46.8	10	0.875	2	0.1	N 76 W	2.15	6.07 "
1857	45.4	+ 0.2	63.5	27.7	35.8	10	1.040	2	0.2	N 19 W	2.93	6.24 "
Mean	45.20	...	66.09	24.63	41.46	11.1	2.697	1.9	1.05	—	—	5.50

MONTHLY METEOROLOGICAL REGISTER AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—NOVEMBER, 1857.

Latitude—43 deg. 39.4 min. North. Longitude—5h. 17m. 33s. West. Elevation above Lake Ontario, 108 *feet.*

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Mean Temp. + or − of the Average	Tens. of Vapour.			
	6 A.M.	2 P.M.	10 P.M.	Mean.	6 A.M	2 P.M	10 P.M	ME'N		6 A.M	2 P.M	10 P.M.	M'N
					°	°	°	°	°				
1	29.516	29.411	—	—	37.5	45.8	—	—	—	.166	.186	—	—
2	29.268	29.195	29.281	29.2570	37.5	44.0	38.9	39.92	− 0.35	188	181	.180	.180
3	.429	.505	.628	.5353	35.3	41.8	37.1	38.22	− 1.78	172	161	166	160
4	.700	.680	.653	.6750	34.6	42.7	41.1	39.15	− 0.62	151	186	218	190
5	.546	.282	.117	.2960	39.7	43.8	50.9	45.57	+ 6.08	218	242	331	275
6	.177	.200	356	.2677	47.3	57.8	46.2	49 92	+10.75	249	171	174	200
7	.520	.458	.465	.4932	38.6	45.4	43.6	42.70	+ 3.70	206	207	238	218
8	.456	.366	—	—	46.9	51.4	—	—	—	291	325	—	—
9	.308	.344	.501	.4095	50.5	46.5	39.8	45.05	+ 6.65	344	285	217	275
10	.729	.805	.915	.8342	34.2	43.5	37.0	37.72	− 0.37	140	151	131	144
11	30.048	30.056	29.992	30.0317	33.5	43.3	36.4	37.08	− 0.70	167	121	153	144
12	29.796	29.525	.519	29.6020	36.1	42.9	39.8	39.75	+ 2.25	166	225	201	198
13	.491	.495	.636	.5467	34.2	38.4	33.2	35.22	− 1.97	151	151	109	139
14	.789	.947	30.056	.9428	22.4	29.5	24.8	25.05	−11.87	075	099	099	091
15	30.004	29 904	—	—	23.7	38.2	—	—	—	111	150	—	—
16	29.098	.464	29.369	.5040	30.8	35.5	33.2	33.02	− 3.18	147	189	174	164
17	.286	.085	.067	.1308	34.6	35.3	34.2	34.97	− 0.83	158	167	145	159
18	28.980	28.906	28.793	28.8800	34.6	39.4	37.9	37.10	+ 1.62	140	123	145	148
19	28.548	28.548	28.869	28.6707	42.2	33.9	25.2	33.53	− 1.55	230	166	118	168
20	28.939	28.915	28.975	28 9533	18.2	27.0	23.8	22.68	−12.08	084	128	115	101
21	29.155	29.191	29.130	29.1615	25.2	28.1	29.9	27.75	− 6.63	103	135	131	127
22	.246	.454	—	—	29.2	24.2	--	—	—	127	100	—	—
23	.214	.109	.390	.2455	28.8	24.5	19.1	24.08	− 9.63	146	084	091	109
24	.414	.440	.788	5790	18.0	19.3	7.2	14.25	−10.02	080	090	044	071
25	30.059	30.161	30.220	30.1500	-2.3	18.0	15.4	11.00	−21.97	033	074	073	062
26	30.243	30.200	30 138	30.1913	16.9	25.6	19.1	20.43	−12.13	079	087	086	086
27	30.123	30 055	30.044	30.0750	19.1	35.0	30.3	27.82	− 4.37	086	168	103	121
28	30.014	29.999	30.028	30.0152	29.5	40.7	33.2	34.45	+ 2.57	110	173	165	151
29	30.011	29.948	—	—	35.0	40.4	—	—	—	153	194	—	—
30	29.737	.621	29.563	29.6390	40.4	42.9	43.8	42.07	+10.98	231	263	242	248
	29.5206	29.4874	29.5307	29.5238	31.20	36.90	32.82	33.64	− 2.61	.155	.161	.164	.157

Day.	Humidity of Air.				Direction of Wind.			Result't. Direction.	Direction of Wind.					Rain in inches.	Snow in inches.
	6 A.M	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M	10 P.M.		6 A.M.	2 P.M.	10 P.M.	Result'.	ME'N		
1	.74	.61	.—	.—	W	S W b S	S W b W	S 42° W	2.0	10.4	10 5	8.17	8.71	inap.	...
2	84	63	76	74	S W b W	W b N	W b S	S 77 W	5.0	15.5	13.6	12.07	12.51	inap.	...
3	85	62	76	70	W b N	W b S	W b S	W	13.0	15.5	4.0	9.57	9.93	...	...
4	75	69	85	79	Calm.	S E b S	N E b E	N 69 E	0.0	4.2	6.2	4.59	5.43	0.005	...
5	90	85	90	90	N E	E b N	S W	S 61 E	6.8	13.5	7.0	3.44	10.08	0.415	...
6	77	36	56	57	S S W	W S W	W b S	S 64 W	7.5	21.0	10.3	7.38	8.42	...	...
7	89	69	85	81	Calm.	E N E	E N E	N 64 E	0.0	11.0	14.5	9.35	10.08	0.145	...
8	91	86	—	—	E N E	E	S S E	S 85 E	10.2	9.6	7.5	4.17	8 83	0.370	...
9	95	91	89	91	W b S	W b N	W S W	S 67 W	4.5	5.5	9.8	8.17	8.62	1.020	...
10	71	53	60	64	S W	S W	W b S	S 55 W	11.2	14.2	10.0	9.58	9.82	...	...
11	87	44	72	67	S W b W	S W b W	W S W	S 52 W	8.9	11.8	4.2	6.79	6.86	...	...
12	79	82	82	81	W S W	S S W	W S W	S 46 W	2.4	13.4	5.5	6.42	7.34	0.030	...
13	76	65	57	67	S W	W S W	N W b N	N 77 W	4.6	15.0	13.8	9.41	11.88	...	inap.
14	62	60	72	65	N N W	N W b N	N W b N	N 32 W	10.5	15.8	6.3	7.03	7.25	...	...
15	84	65	—	—	W S W	W b S	S W b S	S 55 W	2.8	5.8	0.5	4.20	4.43	...	...
16	84	91	93	87	S S W	S S E	Calm.	S 33 W	3.0	2.4	0.0	2.54	3.19	0.145	0.7
17	78	81	73	78	S W b S	S W	S W b W	S 52 W	14.0	15.0	11.4	12.06	12.15	0.025	...
18	74	50	65	67	S W	S W b W	S b W	S 21 W	10.8	14.0	2.5	7.10	10.39	0.140	...
19	86	87	85	84	S S E	S W b S	S W b W	S 45 W	15.2	23.8	19.5	16 18	19.80	0.055	0.2
20	81	86	87	80	W S W	S W b W	S W b W	S 57 W	18.0	17.0	20.0	19.59	19.63	...	0.5
21	75	87	78	82	S W b W	S W	S W	S 44 W	21.0	7.8	11.0	17.69	18.90	...	2.0
22	78	74	—	—	W S W	W b S	Calm.	S 73 W	14.5	13.0	0.0	7.91	8.64	...	0.5
23	92	62	83	81	S b E	N W b W	W b S	N 75 W	4 4	20.4	4.2	7.42	9.59	...	2.5
24	77	82	66	78	S W b W	W S W	N W b N	N 87 W	11.5	13.8	17.2	8.60	11.13	...	0.5
25	74	71	78	76	N W b W	W S W	W S W	S 73 W	4.2	8.0	9.0	9.00	9.33	...	inap.
26	81	61	80	76	W S W	S W b W	W S W	S 64 W	9.2	10.0	6.7	6.89	6.99	...	...
27	80	83	62	77	W S W	S S W	S W b S	S 42 W	7.2	12.4	4.0	3.88	4.00	...	...
28	66	69	87	75	S W b S	S W b S	S S W	S 20 W	2.7	3.4	1.2	1.60	1.98	...	...
29	75	78	—	—	N E	E b N	E N E	N 67 E	3.0	9.2	8.0	7.22	7.44	0.140	...
30	93	97	88	94	E N E	E S E	S E b S	S 20 E	4.0	7.2	8.2	1.05	4.03	0.745	...
	.80	.71	.77	.77	....	....	....	....	....	....	....	....	9.25	3.235	6.9

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR NOVEMBER.

Highest Barometer........................ 30.281 at 10 a. m., on 20th } Monthly range=
Lowest Barometer .... 28.452 at 10 a. m., on 19th } 1.829

Self-regist'ing Thermom.
- Maximum Temperature........... 58°.2 on p. m. of 8th } Monthly range=
- Minimum Temperature........... —3°.5 on a. m. of 25th } 61.°7
- Mean maximum Temperature .... 39°94 } Mean daily range=
- Mean minimum Temperature .... 26°55 } 13.39
- Greatest daily range ....27°0 from a. m. of 19th to a. m. of 20th.
- Least daily range.................. 5°6 from p. m. of 17th to a. m. of 18th.

Warmest day......... 6th ... Mean temperature......... 49.92 } Difference = 38°92.
Coldest day........... 25th ... Mean temperature......... 11°00 }

Maximum { Solar.............................. 69°0 on p. m. of 6th, } Monthly range=
Radiation. { Terrestrial......................—9°.2 on a. m. of 25th. } 78°2

Aurora observed on 2 nights, viz., on 17th and 23rd.
Possible to see Aurora on 14 nights; impossible on 16 nights.

Raining on 14 days,—depth 3.235 inches; duration of fall 73.6 hours.
Snowing on 9 days,—depth 6.9 inches; duration of fall 40.2 hours.

Mean of cloudiness = 0.67.
Most cloudy hour observed, 2 p. m., mean = 0.83; least cloudy hour observed, midnight, mean, =0.52.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
781.66	2675.52	920.96	4366.37

Resultant direction S. 61° W.; Resultant Velocity 5.45 miles per hour.
Mean velocity.......................... 9.25 miles per hour.
Maximum velocity .... 29.4 miles from 6 to 7 p. m., on 21st.
Most windy day...................... 19th...Mean velocity 19.80 miles per hour.
Least windy day .... 28th...Mean velocity 1.98 ditto.
Most windy hour ... 1 to 2 p. m............Mean velocity 12 70 ditto. } Difference
Least windy hour ... 9 to 10 p. m...........Mean velocity 7.51 ditto. } 5.19 miles.

5th. Sheet Lightning from 7 p. m. and Thunderstorm from 9 to 9-30 p. m.
8th. Sheet Lightning from 7 to 10 p. m.
10th. Ice on the pools at 6 a. m.
19th, 20th and 21st. Continual high wind and great Barometric depression.
22nd. Faint Halo round the Moon at 8-15 p. m.
25th. Toronto Bay frozen over.
27th. Large and perfect Halo round the Moon from 7 p. m.
29th. Halo round the Moon from 5-30 p. m.

Barometer.—The mean height of the barometer was .095 below the average; the minimum 28.452 was the lowest reading ever recorded; and the monthly range was the greatest for any November during the series.

Temperature.—The mean temperature was 3°08 below the average; the minimum (-3°5) was the lowest entry, and the 25th was the coldest day of any November on record: the monthly range also was never exceeded in any previous November.

Rain and Snow.—The depth of rain was ·294 inches above the average, and the depth of snow also was 3.63 inches in excess of the mean.

Wind.—The resultant direction and velocity from 1848 to 1857 were N. 32° W. 2.06 miles per hour.

There was a marked absence of meteors at the epoch of their usual appearance.

The freezing of the Toronto Bay on the 25th was the earliest instance of this occurrence ever recorded. On the return of the mild weather the ice again broke up.

COMPARATIVE TABLE FOR NOVEMBER.

Year.	Temperature.					Rain.		Snow.		Wind.		
	M'n.	Diff. from Aver.	Max. ob'd.	Min. ob'd.	Range.	No. of days.	Inch's.	No. of days.	Inch's.	Resultant. Direction.	Resultant. V'y	Mean Force or Velocity.
	°	°	°	°	°							
1840	35.9	—0.7	54.4	20.5	33.9	5	1.220	8	...	...	...	....
1841	35.0	—1.6	63.2	7.6	55.6	8	2 450	5	...	...	...	0.91 lbs.
1842	33.3	—3.3	50.6	7.6	43.0	9	5.310	10	...	...	...	1.22
1843	33.5	—3.1	51.2	14.4	36.8	10	4.765	7	1.2	...	...	0.59
1844	34.9	—1.7	40.8	12.0	37.8	8	imp.	4	8.0	...	...	0.48
1845	36.8	+0.2	58.8	7.6	51.2	7	1.105	4	5.0	...	...	0.53
1846	41.3	+4.7	55.5	18.2	37.3	12	5.805	2	0.4	...	...	0.64
1847	38.6	+2.0	58.2	7.8	30.4	14	3.155	3	Inapp	...	...	0 36
1848	34.5	—2.1	49.3	16.5	32.8	9	2.020	3	1.4	N 81° W	1.81	4.81 mls.
1849	42.6	+6.0	56.7	28.4	28.3	10	2.815	2	1.0	N 39° W	1.55	4.78
1850	38.8	+2.2	62.3	18.1	44.2	7	2.955	1	Inapp	N 42° W	1.43	5.27
1851	32.9	—3.7	50.1	16.5	33.6	5	3.885	6	6.7	N 50° W	1.25	4.70
1852	36.0	—0.6	50.4	18.7	31.7	7	1.775	3	2.0	N 59° W	1.53	6.50
1853	38.7	+2.1	54.1	14.4	39.7	15	2.425	6	2.7	N 1° E	0.56	5.52
1854	36.8	+0.2	54.9	15.1	39.8	13	1.115	4	1.3	S 88° W	3.72	7.58
1855	38.6	+2.0	54.1	18.7	35.4	8	4.590	6	3.0	N 66° W	3.18	10.81
1856	37.4	+0.8	56.4	22.8	33.6	10	1.375	9	9.5	S 85° W	2.95	8.75
1857	33.5	—3.1	57.8	-2.3	60.1	14	3.235	9	6.9	S 61° W	5.45	9.25
M	36.62	...	54.88	14.59	40.29	9.5	2.941	5.1	3.27	...	...	6.80 mls.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—OCTOBER, 1857.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL. D.

Latitude—45 deg. 32 min. North. Longitude—73 deg, 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32° Fahr. 6 A.M.	2 P.M.	10 P.M.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	Tension of Vapor. 6 A.M.	2 P.M.	10 P.M.	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Velocity in miles per hour. 6 A.M.	2 P.M.	10 P.M.	Mean direction of Wind.	Rain in Inches.	Snow in Inches.	WEATHER, &c. A cloudy sky is represented by 10; A cloudless sky by 0. 6 A.M.	2 P.M.	10 P.M.
1	29.895	29.902	29.907	36.0	57.0	41.5	.192	.398	.253	.84	.84	.92	S W	S S E	N b E	1.87	3.57	1.97	...	0.376	...	C. C. Str. 4.	Str. & Ni. 6.	C. St. 8. Thun.
2	30.005	30.114	30.211	30.9	57.8	37.2	.177	.370	.199	.95	.79	.83	N N E	E N E	N E	7.30	9.35	1.42	...	...	...	Clear.	Clear.	Clear.
3	.224	.139	.229	35.0	54.9	42.2	.203	.295	.233	.91	.66	.85	N E	N E	E N E	11.87	14.42	2.97	...	...	...	Do.	Do.	Cirr. 2.
4	.114	.017	.037	36.2	65.0	46.5	.192	.125	.303	.83	.68	.93	N E by E	S S W	W S W	2.51	0.18	0.54	...	...	...	Do.	Do.	Clear.
5	.130	.036	29.997	41.2	63.2	50.5	.253	.335	.349	.92	.75	.90	S W b S	W S W	S W	0.22	0.65	0.17	...	...	...	C. C. Str. 4.	C. C. Str. 8.	C. Str. 10.
6	29.800	29.676	.839	48.1	61.6	51.3	.349	.283	.274	.94	.71	.76	W S W	W	N W	0.71	5.65	5.32	...	...	...	C. Str. 10.	C. St. 8.	Clear.
7	.800	.820	.840	41.1	64.0	47.0	.261	.101	.291	.85	.67	.86	W N W	S S W	S W	3.62	3.57	3.75	...	...	...	Clear.	Clear.	Do.
8	.712	.612	.684	46.2	68.2	55.7	.263	.445	.393	.92	.65	.88	S W	S W b W	S W b W	10.98	4.93	8.96	...	...	...	C. Str. 6.	Do.	Cir. Cum. 2.
9	.839	.828	30.050	39.0	57.9	41.0	.220	.310	.217	.88	.66	.79	N E	W N W	N E	4.50	1.29	0.63	...	...	...	Clear.	Do.	Clear.
10	30.098	30.076	.120	36.0	63.0	40.3	.192	.306	.227	.83	.63	.85	E N E	N E b E	E	0.62	1.48	0.17	...	...	...	Do.	Do.	Do.
11	.026	29.989	29.930	37.7	69.0	44.6	.229	.461	.282	.91	.65	.92	E	S	S E b S	0.00	2.10	0.64	...	...	...	Do.	Do.	Do.
12	29.975	.916	.820	35.8	67.0	57.5	.203	.480	.447	.89	.72	.94	S	S by E	S W b W	0.12	3.75	0.57	...	...	...	Light Cir. 4.	C. C. St. 6.	Str. 10.
13	.860	.842	.877	37.0	64.0	49.1	.416	.5[illegible]2	.330	.96	.90	.91	S W b W	S W b W	W S W	0.60	0.10	0.51	...	0.350	...	Nimb. 10.	Ni. 10.	Clear.
14	.929	.866	.893	40.4	61.8	43.3	.253	.[illegible]56	.272	.91	.84	.91	W S W	S S E	N N W	0.60	0.01	0.00	...	...	...	Fog.	C. C. Str. 6.	Do.
15	.756	.542	.449	41.0	48.7	46.5	.282	.324	.302	.91	.90	.94	N b E	N E b E	N E b E	5.70	15.[illegible]	13.70	...	0.933	...	C. Str. 10.	Ni. 10.	Ni. 10.
16	.308	.403	.475	46.0	50.0	46.5	.313	.304	.282	.93	.81	.86	N E by E	N b E	N b W	20.56	6.90	5.06	...	1.176	...	Ni. 10.	C. St. 9.	Cir. Str. 10.
17	.511	.698	.819	38.0	48.0	37.0	.200	.225	.219	.79	.64	.91	W	W	S W b W	16.82	9.72	6.2[illegible]	...	...	...	St. 4.	Clear.	Do. 4.
18	.883	30.075	30.117	39.9	59.7	38.6	.196	.216	.220	.76	.65	.90	W S W	W	S S E	4.22	11.77	2.42	...	...	...	C. Str. 8.	C. Str. 4.	Do. 10.
19	.940	29.562	29.571	42.1	50.0	44.6	.263	.341	.283	.91	.89	.90	S S E	S S E	W b N	0.87	9.80	4.67	...	0.478	...	Ni. 10.	Ni. 10.	Ni. 10.
20	.564	.512	.716	37.0	33.0	32.5	.218	.197	.191	.91	.95	.94	W b S	W b S	W b N	6.62	11.76	6.15	...	0.300	Inp	Ni. 10. Sleet	C. St. 8.	C. St. 8.
21	.974	.891	30.047	32.0	37.2	29.1	.191	.182	.152	.91	.76	.85	W N W	N W	W b N	23.75	10.70	9.80	...	...	...	C. St. 4.	Do. 8.	Clear.
22	30.131	30.113	.173	24.0	44.0	31.1	.091	.241	.171	.63	.79	.89	N W b N	S S W	S b E	3.40	2.01	0.20	...	...	...	Clear.	Do. 2.	Do.
23	.111	29.943	.106	31.0	58.0	37.6	.158	.367	.218	.81	.75	.95	S S E	S S E	S b W	0.00	0.62	0.71	...	...	...	C. St. 4.	Light Cir. 4.	Clear. Aur. Bore.
24	.002	.942	29.908	32.5	49.2	42.8	.182	.290	.263	.89	.80	.90	S S E	S E	E	0.08	0.03	0.04	...	...	...	Clear.	C. Str. 9.	C. St. 4. Do.
25	29.836	.704	.601	42.9	46.0	44.0	.263	.303	.292	.91	.93	.95	S E b E	N E b E	N E b E	0.31	1.18	15.77	...	1.497	...	C. C. St. 6.	Rain.	Rain.
26	.525	.454	.523	42.6	49.0	45.0	.272	.328	.282	.96	.91	.89	N E b E	N E b E	N N E	26.24	23.23	26.80	...	1.713	...	Rain.	Do.	C. St. 9.
27	.680	.721	.823	34.2	38.6	34.0	.170	.226	.178	.79	.90	.85	N N E	N E	N E	32.46	10.06	20.61	...	...	...	Str. 8.	C. Str. 9.	Do. 10.
28	.800	.755	.806	30.0	32.7	31.7	.160	.187	.175	.86	.89	.87	N E	N E	N E b E	14.77	14.90	6.22	...	...	...	C. St. 6.	Do. 10.	Do. 10.
29	.640	.638	.650	32.1	35.5	33.5	.160	.203	.187	.84	.90	.90	N E b E	N E b E	N E b E	0.81	0.15	0.37	...	Inapp	...	Do. 10.	Do. 10.	Do. 10.
30	.631	.658	.757	33.1	41.0	38.1	.188	.235	.226	.89	.85	.91	W S W	S W b W	S S W	0.00	0.08	0.05	...	Inapp	...	Do. 10.	Do. 9.	Do. 8.
31	.786	.733	.774	35.0	44.0	38.2	.203	.261	.226	.91	.85	.91	S S W	S E	S E b E	0.12	0.60	0.32	...	...	...	Do. 8.	Do. 10.	Do. 10.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—NOVEMBER, 1857.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL.D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32°			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind.	Rain in Inches.	Snow in Inches.	WEATHER, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.				6 A.M.	2 P.M.	10 P.M.
1	29.698	29.616	29.601	38.2	44.6	38.5	.228	.223	.226	.91	.73	.91	s w	s w b w	s b w	0.12	4.23	1.63	...	...	...	C. C. Str. 4.	C. Str. 8.	C. C. Str. 8.
2	.460	.384	.451	37.1	45.0	33.5	.218	.253	.210	.91	.80	.91	s b w	s w	s b E	7.35	7.75	0.76	...	0.416	...	C. Str. 8.	Do. 6.	C. Str. 4.
3	.484	.649	.694	36.0	40.4	38.6	.210	.227	.210	.91	.85	.91	w s w	w s w	w b N	4.65	10.17	2.65	...	...	...	Do. 8.	Do. 6.	Do. 10.
4	.872	.957	30.026	30.1	37.5	27.5	.168	.218	.146	.88	.88	.88	w	w b N	E N E	9.91	2.08	2.12	...	...	...	Clear.	Cirr. C. 8.	Clear.
5	.954	.842	29.697	29.6	40.6	38.7	.161	.210	.234	.89	.79	.92	E N E	N E b E	E b N	0.50	5.80	2.22	...	0.330	...	C. Str. 10.	Cir. Str. 4.	Rain, Thunder
6	.420	.472	.482	57.0	60.4	48.0	.218	.371	.290	.91	.71	.81	s w	s w b w	w s w	15.13	8.97	10.05	...	0.530	...	Do. 3.	Clear.	C. Lt. in N. E. at
7	.652	.760	.890	40.3	51.0	42.0	.210	.274	.243	.79	.70	.85	w s w	w s w	N E b E	5.22	4.27	0.07	...	...	...	Clear.	C. Str. 2.	C. Str. 10. [7pm
8	.850	.937	.939	34.4	38.5	38.2	.203	.226	.216	.91	.91	.91	s E b E	N E b E	N N E	19.96	9.80	14.61	...	1.120	...	Nimb. 10.	Rain.	Rain.
9	.610	.533	.595	46.0	64.1	55.0	.292	.565	.420	.89	.94	.98	s E	s s E	w s w	13.35	4.22	9.37	...	1.642	...	Rain.	C. Str. 10.	C. Str. 6.
10	.784	.883	30.009	44.0	41.9	34.1	.289	.241	.178	.96	.79	.85	w s w	w s w	w s w	4.73	24.85	9.22	...	0.390	...	Do.	Do. 4.	Clear.
11	30.092	30.084	.187	32.0	40.5	37.5	.191	.210	.199	.93	.79	.83	s w	s w	w s w	10.02	3.91	8.66	...	...	...	Clear.	Do. 8.	C. Str. 10.
12	30.042	29.848	29.725	30.1	35.0	34.1	.160	.203	.195	.86	.90	.89	s E b E	s w b s	w s w	1.51	1.81	5.20	...	0.160	...	C. Str. 9.	Sleet.	Rain.
13	29.654	.585	.721	33.0	43.0	31.6	.197	.233	.185	.95	.79	.90	w s w	w s w	N b w	5.65	4.83	12.82	...	0.202	...	Do. 6.	C. Str. 8.	C. Str. 6.
14	.883	.930	30.082	20.0	25.6	23.6	.089	.123	.120	.68	.79	.82	N w	w N w	w	2.42	8.30	8.96	...	...	...	Clear.	Do. 4.	Do. 2.
15	30.107	.975	.000	22.7	34.0	32.2	.127	.204	.197	.88	.89	.94	w s w	w s w	w s w	7.27	6.42	6.65	...	...	...	Str. 10.	Do. 10.	Do. 10.
16	29.998	.704	29.650	30.0	37.8	31.1	.177	.218	.185	.95	.90	.96	w s w	s E	s E	1.73	1.62	2.27	...	...	...	C. Str. 6.	Do. 4.	Snow.
17	.401	.297	.221	32.8	37.1	34.0	.189	.201	.204	.90	.83	.94	w s w	w s w	w s w	4.60	2.81	3.06	...	Inp.	2.01	C. Str. 8.	Do. 10.	C. Str. 8.
18	.158	.147	.247	32.4	38.4	34.1	.197	.214	.281	.95	.86	.95	s s w	s s w	s s w	7.31	4.77	9.10	...	...	Inp.	Do. 8.	Do. 2.	Do. 8.
19	.133	.003	.010	33.2	47.7	33.6	.204	.271	.204	.96	.80	.92	E b s	s E	w s w	6.42	1.83	23.48	...	...	...	Do. 10.	Do. 4.	Sleet.
20	.104	.140	.218	25.4	27.6	20.0	.147	.137	.101	.92	.82	.77	w s w	s w	s w	15.70	11.68	17.57	...	0.376	Inp.	Do. 4.	Do. 10.	Clear. [a.m.
21	.212	.380	.518	23.5	32.1	27.6	.112	.167	.148	.77	.82	.88	w s w	w s w	s b E	15.57	11.02	12.67	...	...	...	C. C. Str. 4.	Do. 9.	Sno, Mock sun.
22	.504	.500	.707	26.4	38.0	26.6	.146	.173	.135	.88	.70	.83	s w	s w	w s w	4.30	8.31	7.11	...	...	...	C. Str. 10.	Do. 6.	Cirr. Str. 2.
23	.684	.244	.310	26.4	34.0	33.0	.146	.195	.197	.88	.91	.94	E N E	s E	w s w	2.22	3.27	10.73	...	0.643	Inp.	Do. 10.	Do. 6.	Do. 10.
24	.484	.508	.657	16.0	25.6	18.0	.093	.147	.106	.85	.90	.87	w s w	s w b w	N w	12.83	13.81	7.60	...	...	...	Do. 4.	Do. 8.	C. Str. 4.
25	30.078	30.201	30.500	1.0	13.0	9.7	.043	.068	.079	.84	.67	.80	w s w	w	w s w	37.64	15.82	12.81	...	...	...	Clear.	Clear.	Clear.
26	.314	.291	.306	10.1	28.3	25.1	.082	.119	.129	.90	.68	.82	w s w	s w	s w	7.99	7.65	5.27	...	...	...	C. C. Str. 4.	C. Str. 10.	C. Str. 9.
27	.197	.164	.223	23.0	36.0	31.8	.112	.192	.182	.77	.83	.90	s w b w	w s w	s s w	14.32	5.45	4.03	...	...	...	Clear.	C. C. Str. 6.	Do. 8.
28	.282	.102	.229	34.1	37.2	35.2	.199	.199	.203	.91	.83	.91	s b w	w s w	w s w	5.03	8.85	3.57	...	...	...	C. Str. 4.	C. Str. 8.	Do. 10.
29	.242	.277	.331	34.6	47.0	33.0	.203	.271	.197	.91	.80	.97	s w	E	N E b E	0.01	0.50	7.31	...	Inp.	...	Do. 10.	Cirr. Str. 2.	Clear.
30	.198	.058	29.967	32.8	42.6	40.9	.199	.243	.253	.93	.85	.92	N E by E	N E b E	s s E	8.36	4.52	14.76	...	...	...	Do. 9.	C. Str. 8.	C. Str. 10.

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Lowest Point of Terrestrial Radiation .... 22°.1

Mean of Humidity .... .859

Amount of Evaporation .... 3.86 inches.

Rain fell on 10 days, amounting to 6.823 inches; it was raining 90 hours and 56 minutes and was accompanied by thunder on one day.

Snow fell on the 20th day. Inapp.

Most prevalent wind, N. E. by E. Least prevalent wind, E.

Most windy day, the 20th; mean miles per hour, 28.78.

Least windy day, the 14th; mean miles per hour, 0.03.

The electrical state of the atmosphere has indicated feeble intensity.

Ozone was in large quantity.

Aurora Borealis visible on 2 nights.

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	Monthly Mean	29.681
	Monthly Range	1.341
Thermometer	Highest, the 9th day	64°.1
	Lowest, the 25th day	1° 0
	Monthly Mean	33°69
	Monthly Range	63°1

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Rain fell on 12 days amounting to 5.749 inches; it was raining 74 hours 15 minutes, and was accompanied by thunder on one day.

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***** The Annual Subscription, Country Members, $3; in Toronto, $4, is due on the 1st January.**

The next Number of this Journal will be issued in March.

Mar 29

THE

CANADIAN JOURNAL

OF

INDUSTRY, SCIENCE, AND ART:

CONDUCTED BY

THE EDITING COMMITTEE OF THE CANADIAN INSTITUTE.

NEW SERIES. NUMBER XIV.

MARCH, 1858.

TORONTO:

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CANADIAN INSTITUTE.

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*** *Communications for the Journal to be addressed to the General Editor,* DR. WILSON, *University College, Toronto.*

THE CANADIAN JOURNAL.

NEW SERIES.

No. XIV.—MARCH, 1858.

THE PRESIDENT'S ADDRESS.

BY THE HON. CHIEF JUSTICE DRAPER, C.B.

Read before the Canadian Institute, January 9th, 1858.

Honored by being a second time placed in the position of your President, it would ill become me to dwell upon what you have so generously overlooked: my want of adequate fitness for the discharge of the duties of that office. I will thank you, however, for the testimony you give that you believe in the sincerity of my desire for the success and advancement of the Canadian Institute, and will endeavor to derive greater confidence in myself for the future from this sanction and approval on your part of that which is past, and will here borrow, as not wholly inapplicable, the language of Montesquieu on a somewhat similar occasion,—" Soit que vous m' " ayez fait justice—soit que j'ai séduit mes juges, je suis egalement " content de moi meme—le public va s'aveugler sur votre choix— " il ne regardera plus sur ma tête que les mains savantes qui me " couronnent."

It is a highly gratifying circumstance, that, notwithstanding the commercial difficulties of the past year, the Report of the Council for 1857 affords as great proof of satisfactory results as did that of 1856; and the continued success of the Journal of the Institute, the accession of new members, the numerous donations to the

library and the museum, the increased attendance at the meetings, and the character of the papers communicated thereat, are all justly set forth as legitimate subjects of congratulation.

In reference to the papers communicated, we are well reminded, by the Committee editing the Journal, that the contribution of materials for its pages, from the members of the Society generally, is indispensable to its permanent success. We have no right to expect that the burden of supplying the requisite matter should be cast upon a small minority of those who ought to constitute the working members of the Institute. Of the value of the services rendered by those whose exertions have given to the Journal of the Institute its present character and reputation, we cannot speak or think too highly. It would be, on the part of those who are competent—and I will not doubt but that, among our 600 members, there are many competent,—a just mode of shewing that they fitly appreciate these labours, by sharing, and so lightening them. In adding to the record of facts and phenomena observed, there are few who could not render their quota of assistance; and such a record becomes a treasury of knowledge for philosophic investigation, for elucidating truths already known, or the discovery of others yet hidden from us.

I should be wanting, alike to the Council and to the Institute, if I did not especially call attention to the success of the Journal, so justly attributed, in the Annual Report of the Council, to the ability and judgement of its conductors. It is no slight proof of the value of such a publication, and of the character of those papers which have become known through its pages, that several of them have been deemed worthy of republication in some of the leading scientific journals of Europe; while in return for copies of the Journal transmitted to different societies and learned bodies in other parts of the world, the Institute has already received their printed proceedings, together with other publications of great value. Everything tends to shew the reputation and standing which, through the Journal, this Institute is attaining; and strengthens the claim to our sincere and warmest thanks, which the Editor, and the Committee who have been his coadjutors, have so amply established.

I must not leave the subject of our own proceedings as an Institute, however, without adverting to the fact—within all your recollections,—that at one of the ordinary meetings last year, a tribute of profound respect and regard, mingled with unfeigned sorrow for his melancholy death, was paid to the memory of the late Hugh

Miller, by one of our number. We cannot look back on the last year, and call up before us the events most interesting to those engaged in the cultivation of scientific pursuits, without pausing for a moment over this sad reminiscence, and taking comfort in the reflection—which was suggested on the occasion to which I have referred,—that in the profoundest depths of geologic research, the laborious exertions which overwrought the brain, never made Miller a less devout believer in religious truth. He seems to have proved in his own life-history, what Bacon has so well expressed,—"It is "true that a little philosophy inclineth man's mind to atheism; but "depth in philosophy bringeth men's minds about to religion: for "while the mind of man looketh upon second causes scattered, it "may sometimes rest in them and go no further; but when it "beholdeth the chain of them confederate and linked together, it "must needs fly to Providence and Deity."

Turning once more to domestic matters, I shall beg permission to occupy your attention with a few observations touching the Magnetic and Meteorological Observatory in this city; which I am the more induced to do from a doubt whether the intrinsic value of the establishment, and its effects in making Toronto known throughout the civilised world as the seat of this Observatory, are sufficiently valued and appreciated among us.

Established at the instance of the Royal Society by the Imperial Government, this Observatory formed one of a chain of stations which were, almost simultaneously, called into existence, either by national support or private liberality, over the whole face of the globe, and were designed, in connection with exploring expeditions, both by sea and land, to furnish the data by which it was hoped the secrets of that mysterious agency, the earth's magnetic force, might be laid bare. Its existence was prolonged much beyond the period which had originally been proposed, and which was found quite insufficient for the accomplishment of the work,—the liberality of the Imperial Government being successfully appealed to by the same learned body to whose exertions its institution was due,—and when ultimately the period arrived when its abandonment was no longer to be deferred, the offer was made to transfer it to the Province with its complete equipment, free (with slight exceptions) of cost, and subject only to the condition of its permanent maintenance. It is a just ground for congratulation that this generous offer was accepted, and that the Province has responded to the call of Science, not only by providing an ample endowment for the Observatory, but by replacing the temporary

wooden structure in which its operations were formerly conducted, by handsome and substantial erections of stone. It may fairly be allowed to the members of this Institute to indulge the belief that these desirable results were effected, in part at least, by the urgent representations which they and their President at the time made to the Government; nor will the pardonable pride they may feel in the matter be lessened by the knowledge that, out of all the Colonial Observatories which were in similar circumstances, this is the only one the retention of which has been accomplished. The outlay on the Observatory for its erection and equipment from first to last has probably exceeded £5,000, and I believe that in completeness and efficiency it is not surpassed, if even equalled, by any observatories in the world. Three large quarto volumes, containing the observations made here, have already been published by the Imperial authorities (and a fourth is yet due), carrying the name of Toronto into all parts of the earth where science is cultivated; and so remarkable and valuable have been the theoretical results deduced from them (to which I shall presently more particularly allude,) that it is not too much to say that the name of a Canadian city, which will be sought for in vain on maps twenty years old, has now become, by means of its Observatory, familiar in the mouths of European savans as a "household word."

Very few, if any, subjects of inquiry are of greater interest and probable importance to science, than that of terrestrial magnetism. Practically familiar, as we have been, for a long course of years, with many of its phenomena, the theories invented to account for and to explain them were more owing, as has been well remarked, "to the boldness of ignorance than to the just confidence of knowledge;" and the "want of a foundation whereon the advancement of that science, on inductive principles, might be based, was strongly and extensively felt."

The objects of the Magnetic Observatories were, as I understand, to investigate the periodical variations in the terrestrial magnetic force, by suitable instruments and methods; to separate each from the others, and to seek its period, its epochs of maximum and minimum, the laws of its progression, and its mean numerical value and amount; that, by a combination of the results attained, a general theory of each, at least of the principal periodical variations, might be derived; and tests be thus supplied, whereby the truth of physical theories propounded for their explanation might be examined. With the observation of their *periodical variations*, was combined a comparison with meteorological variations of a

periodical character; which together with those "*secular changes*, "which with slow but systematic progression alter the whole aspect "of the magnetic phenomena on the surface of the globe, from one "century to the next, and which in their nature are not improbably "intimately connected with the causes of the magnetism of the "globe itself," were deemed subjects of inquiry of the highest importance by "those who, by the inductive process, would seek to ascend to general laws and to the discovery of physical causes."

It is beyond my province, and still more beyond my power, to attempt to trace and define the progress of these observations, and the results which, so far, have been attained. But I am justified in remarking, that the observations recorded here in Toronto, occupy a very high place in the estimation of those scientific men whose attention is devoted to this interesting branch of science. Major General Sabine, himself a member of the Committee of the British Association for the Advancement of Science, by which the attention of Her Majesty's Government was solicited to the expediency of establishing fixed Observatories in the British Colonies, has remarked that the observations at the station at Toronto considerably exceeded 100,000 in number: that "Toronto is the first and, as "yet, the only station at which the numerical values at every lunar "hour of the lunar-diurnal variations of the three elements," viz.: the horizontal direction, the dip, and the intensity of the magnetic force, "have been published." And he pays this handsome tribute to those who have had charge of this Observatory: "It is with "much satisfaction, and with a well-deserved recognition of the "pains which have been bestowed by the successive Directors of the "Toronto Observatory and their assistants, that I am able to refer "to the determinations of the absolute values and secular changes "of the three elements contained in the third volume of the Toronto "Observatory, in evidence that the instrumental means that were "devised, and the methods which have been adopted, have proved, "under all the disadvantages of a first essay, sufficient to determine "the data with a precision which is greatly in advance of preceding "experience, and, as far as may be judged, equal to the present requirements of theoretical investigation. This is the more deserving of notice, because Toronto is a station where the casual and "periodical variations, which it was apprehended would seriously "interfere with the determination of absolute values, are unusually "large. We may derive, therefore, from the results thus attained, the "greatest encouragement to persevere in a line of research which is

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which, if successful, will probably bring about a complete revolution in our commercial marine,—is built of iron, and that however fully, in other respects, the expectations of her projectors may be answered, her success cannot be deemed perfect while this element of difficulty and danger remains. Nor can I omit to call on the Institute to join with me in deploring the death during the past year of a distinguished philosopher, whose name is especially connected with this subject, and to whom most of the improvements in the correction of the Mariner's compass are due. I allude to the lamented Dr. Scoresby.

The hopeful anticipations which were indulged in at our last annual meeting, respecting the Atlantic telegraph, have not as yet been realized. But we may still, I firmly believe, continue to indulge them, and treat their realization as merely postponed. The disappointment of last season has not shaken confidence in the ultimate success of the undertaking. The check that has been met with will but stimulate the ardor and ingenuity of those who are entrusted with its execution. Nothing has happened to create a doubt that the end is attainable, and that the means, in important particulars at least, are well adapted to attain it. No unforeseen obstacle of an insurmountable character has been found; nor has anything happened which should give rise to a fear that any such obstacle in reality exists. The accidental failure—for it is to be looked upon in no worse light,—may possibly give rise to some change in the details of execution, and may suggest further precautions and still more careful preparations for the next attempt. The indispensable qualifications of those employed in the work; their steady subordination and undeviating compliance with the directions given for their guidance; and the undivided—I had almost said despotic—authority of the one master-mind which is to superintend, will no doubt be sedulously secured, and under the blessing of that Divine power which ruleth the raging of the winds and the seas, we shall shortly behold the Old and the New World brought closer together by the rapid interchange of friendly and mutually advantageous communications. And viewing the electric chain which shall thus unite them as a bond of peace and good will between the descendants of one common stock, we may well from our inmost hearts echo the dying words of father Paul, "*Esto perpetua.*"

But while the practical application of the discoveries of science to the intercourse of nations, is calculated to produce such widely extended and beneficial results, its study and cultivation generate among its followers a large and generous spirit independent of national

or political distinctions. This was most happily evinced during last summer in the meeting of the American Association for the advancement of Science, held by special invitation, at Montreal; an assembly which seems to have been—as it was well to be hoped and expected—alike gratifying to the members of learned Associations there assembled, and to the inhabitants of the city whose hospitality was so freely tendered and so frankly received. Possibly the universal desire to extend a hearty welcome to their visitors, joined to that thirst for knowledge which is characteristic of the fairer part of the Creation, by causing "a gay assemblage of ladies which graced the entertainment," may have produced among the more susceptible of the scientific assemblage a somewhat divided homage, which the sterner votaries—anchorites, who had for the occasion emerged from their studious cells,—disapproved of, as inconsistent with the devotion due alone at the shrine in whose honor they had met. But it is also satisfactory to find that many valuable contributions to science were made in the different addresses delivered and papers read, and that the kindly feeling created by the visit of the Canadian deputation to Albany in the preceding year was strengthened by the Congress of Scientific men, American and British, gathered at Montreal. We, as Canadians, may also be permitted to indulge in an honest self-congratulation at the position maintained at both places by our scientific representatives.

I must be allowed to state to you, for it was to my position as your President that I attribute the distinction, that during my recent visit to England, I was a guest at the Celebration of the 104th Anniversary of the Society for promoting Arts, Manufactures and Commerce, on the 23rd June last, and sat next the noble Lord who presided on that occasion. The gratification I there experienced in the Society of many men of distinguished reputation in various branches of Science and Art, was greatly enhanced by the reflection, that my invitation was a mark of friendly interest and regard for this Colonial Institute with which it was my good fortune to be thus connected, and was an evidence of the increasing interest felt at home in the advancement and prosperity of Canada.

It is the hope that our Institute may in time accomplish for this Province what the Royal Societies of London and Edinburgh, and other kindred societies such as the one I have just referred to, have done for Great Britain, that must animate us to perseverance and additional exertion. We may confidently look for all the encourage-

ment and coöperation which men of education and of habits of intellectual thought among us can give. To maintain and to advance this Institute are in more senses than one the duty of enlightened patriotism. In a country governed through the medium of representative institutions, and in which the greatest possible amount of civil and religious liberty is enjoyed, it is impossible but that differences of a political or of a sectarian character must prevail. While the community, though rapidly increasing, is yet comparatively small, there is greater danger than exists on a larger theatre, that such differences should degenerate into personal hostility or individual rancor. But here, in this Institute, may be found an arena where no such differences can ever be permitted to find an entrance. It is here that all those who appreciate the worth of science and its power to contribute to the real wealth, the true greatness of the country, may find a common ground of action; where the love of knowledge, the refinement of education, the grace of scholarship, may, for the time at least, smooth the asperities of other pursuits, and exercise a healing influence, before which the bitterness of sectarian and party contentions shall at last disappear.

We may well aspire to join ourselves to those who are advancing the triumphs of scientific discovery, and are applying those discoveries to the benefit of their fellow men; to form part of that mighty host, who in the increase of knowledge perceive an augmentation in the excellence of their own condition, making intelligent man still more intelligent. Never was there an era wherein greater triumphs have been wrought, nor upon which such a bright future seems to open itself. The very greatness of present success seems almost calculated to make us doubt its reality; and if it were not that we stand upon facts and not upon theories, we could scarce credit the wonders we see, far less anticipate that they are but the precursors of still greater success. The transmission of our corporal selves is now so accomplished that we scarcely know whether most to wonder at the speed at which we move, or at the possibility of uniting safety with it; while for the transmission of inquiry or intelligence, of thought or of wish, space may be almost said, without hyperbole, to be annihilated. The energy and perseverance which in recent years have solved and are solving so many problems in geography, have in like manner advanced actual discovery into unexplored or imperfectly known regions of science, which,—like this western continent,—at first suspected by the profound thinker, and next foretold by the more imaginative enthusiast, were at last and after repeated failures, followed always by

renewed efforts, discovered and made fully known. While rendering a just homage to those who have made plain hitherto untrodden paths, let it not be forgotten how much remains to be known, how far we are, after all that has been accomplished, from a full and perfect knowledge of the infinite wonders of the created world. Our philosophers of the loftiest intellects and of the largest attainments, need not, like Alexander, mourn that there is nothing left for them to conquer.

RELATIVE DATES OF VARIOUS INTRUSIVE ROCKS CUTTING THE LAURENTIAN SERIES IN CANADA.

BY SIR W. E. LOGAN, F. R. S.

Read before the Canadian Institute, December 12th, 1857.

In describing the distribution of the crystalline limestone bands of the Laurentian series of rocks, in previous Geological papers, it became necessary to allude to a large area of intrusive syenite. There are other igneous rocks, however, in the same district, and the relative dates of all that were observed are very well marked.

The oldest intrusive masses are a set of greenstone dykes, composed of a greenish white feldspar and black hornblende, with a small amount of iron pyrites. Their width varies from ten to one hundred yards, and they all possess a well marked transverse columnar structure. The largest are occasionally moderately coarse-grained, and the smaller fine-grained, but they are all distinctly crystalline. Their general bearing is east and west, but the main dykes occasionally divide, a branch striking off at an angle of from twenty to forty degrees.

These greenstone dykes being always cut off by the syenite where they have been observed to come in contact, it is plain the syenite must be of posterior date. The area which the syenite occupies has been elsewhere described. In its lithological character the rock is very uniform, being composed for the most part of feldspar, either of some tinge of red or a dull white, with black hornblende, and a rather sparing quantity of translucent quartz. The red tinge prevails more on the west side, the white on the east. In the spur

which runs into Wentworth, mica was occasionally found to accompany the hornblende. The rock was rather coarsely crystalline in the main body, but dykes of it, in which the grain was finer, were sometimes observed cutting the limestone and the gneiss. These, however, were never traced from any distance up to the nucleus.

The syenite was found to be cut and penetrated by volcanic rock of a porphyritic character, which is therefore of a still later date. The larger masses of this porphyritic rock consist of fine-grained dull reddish-buff feldspar, with which is mingled a sparing quantity of fine-grained black hornblende, the mixture constituting a base in which well-defined crystals of the same reddish feldspar, of various sizes, from one-eighth to three-eighths of an inch, are thickly disseminated; the base is compact, presenting an impalpable grain, a conchoidal fracture and a jaspoid aspect, with various colors, from light to dark gray, brownish-black, and dull green. In addition to crystals of red feldspar this jaspoid base often contains a multitude of fragments of gneiss, greenstone and syenite, varying in size from small grains to masses several feet in diameter, and these are occasionally so abundant as to give the rock the features of a tufa.

The principal mass of this porphyritic rock occupies a pear-shaped area of about 250 acres, with the small end south, on the third and fourth lots of the fifth and sixth ranges of Grenville, from which, on the east side, a portion is projected into the second lot of the fifth range. The mass is wholly surrounded by the syenite, and a large part of it constitutes a mountain or group of hills, intersected by one or two ravines. In about the centre of the mass, on the summit of one of the hills, there exists a circular depression of about one hundred yards in diameter, nearly surrounded by a tufaceous porphyritic rim of about thirty feet in height. In this depression—which is situated in the sixth range, on the line between the third and fourth lots, about fifteen chains from the front,—there is held a turf bog, with an even surface, from which springs a growth of good-sized greenwood trees; and on sounding the depth of this bog with a boring rod, the rock beneath was found to present the shape of a cup, with the depth of twenty-five feet in the centre, so that, including the rim, the depression would be about fifty feet deep, with the exception of a break down to the level of the bog, on the east side. The nature of the rock, and the difficulty of accounting for the depression by any mode of wearing, gives to it in some degree the air of a small volcanic crater. But if it were such, it must represent only the deeply-seated base of the crater, as the evidence which is

seen in the ice-grooves of the vicinity makes it probable the country has been much worn down by denuding agencies. In this vicinity some entangled beds of gneiss were met with, one of which was traced for upwards of a hundred yards, running about N 70° W. It was surrounded by the porphyritic rock.

From this porphyritic nucleus one or two porphyritic dykes were traced, cutting the syenite for short distances, and some of a similar character were met with at such a distance as to make it probable that there are other porphyritic nuclei.

In the vicinity of the pear-shaped porphyritic intrusion which was first described, there are met with two veins of a special character, cutting the syenite, that deserve to be noticed. They consist of cellular chert, from white to yellowish-brown, or flesh-red, the colors in some cases running in bands parallel to one another, and sometimes rather confusedly mingled, giving the aspect of a breccia. The cells are unequally distributed, some parts of the veins being nearly destitute of them, while in other parts they are very abundant, and of various sizes, from that of a pin's head to an inch in diameter. On the walls of some of these cells or druses, small transparent crystals of quartz are implanted, and in some there are the impressions of cubical forms, resulting probably from crystals of fluor-spar which have disappeared. On analysis, Mr. Hunt finds that the stone yields eight per cent. of soluble silica, and approaches in its composition to the nature of flint. From its cellular structure it would make a very good buhr stone.

The chief vein is on the land of Mr. Lowe. It appears to run in a very straight line, of which the bearing is about east and west, and it stands in a vertical attitude, while its breadth varies from four to seven feet, being apparently, however, in one place, nearly twenty. In the wider parts there are seen, in the middle of the vein, masses six or eight inches thick, of the syenite, which constitutes the wall rock. Where the rock is banded the colors run parallel with the sides. The attitude and associations of the mass clearly show that it cannot be of sedimentary origin, and the soluble silica which it contains, with the volcanic character of the district, suggest the probability of its derivation from hot springs similar to the Geysers of Iceland. Waters holding silica in solution have deposited this material upon the walls of crevices in the syenite, ultimately filling them up.

The intrusive rocks which have been described have a date anterior to the fossiliferous formations. None of a similar character have

been met with breaking through these formatious, and the relations of the base of the lower silurian group, along the foot of the hills composed of the syenite, are such as to make it evident that the fossiliferous beds in some places over-lie worn down parts of the volcanic rock. But all these intrusive masses are cut by a set of dykes, whose relations to the fossiliferous strata are not so certain. These dykes are composed of a finely granular base, with an earthy fracture, consisting of feldspar and pyroxene, and having a dark brownish-grey color. In this base are imbedded rounded forms of black augite, giving brilliant cleavage surfaces, and varying in size from masses not bigger than a pin's head to some of several inches in diameter. These are associated with various sized nodules of calc-spar, filling cells that do not attain the diameter of the largest masses of augite, and with small spangles of mica, grey in fresh fractures, but weathering to a brass-yellow on the surfaces of slightly weathered cracks and joints. Small crystals of sphene were occasionally observed in the rock. In the nomenclature of d'Halloy the rock would be called a *melaphyre*, and is the *augite-porphyry* of some German authors. By many geologists, from the accidental presence of the calc-spar nodules, it would be called an amygdaloidal trap.

These dykes bear a striking resemblance to some of those which intersect the lower silurian group in the vicinity of the mountain of Montreal, and may be possibly of the same age; but none of them have yet been traced continuously from the Laurentian into the fossiliferous rocks.

THE LECTURE ROOM, SMITHSONIAN INSTITUTION, WASHINGTON.

BY PROFESSOR HENRY, LL.D., WASHINGTON.

Read before the Canadian Institute, February 13th, 1858.

In the Eighth number of the Canadian Journal (Vol. II., p. 130), was published an admirable paper, by Professor Henry, Secretary of the Smithsonian Institution, on "Acoustics applied to public buildings." Through the kindness of the author, we are now enabled to present to our readers the accompanying diagrams in illustration of

the manner in which the principles and conditions investigated in that paper, have been practically carried out in the arrangements of the Lecture Room at Washington. The subject is so novel, and of so much importance, that we emphatically call the attention of architects and builders to this successful application of scientific research to purposes of public utility. We have only to add, that, from the accounts we have received, we believe that this first attempt to construct on scientific principles a room which shall fulfil the requirements of hearing has been entirely satisfactory. The following explanatory description by Professor Henry will be readily understood by reference to the article above mentioned. We need only further add that it will be observed, the practicable problem which had to be solved, was not the construction of the most perfect lecture room, in all respects, which the ascertained laws of acoustics, as applicable to public buildings, renderd possible; but the adaptation, by means of general principles previously ascertained, of some portion of a structure already completed, chiefly with a view to architectural effect, to the purposes of a theatre for public lectures.

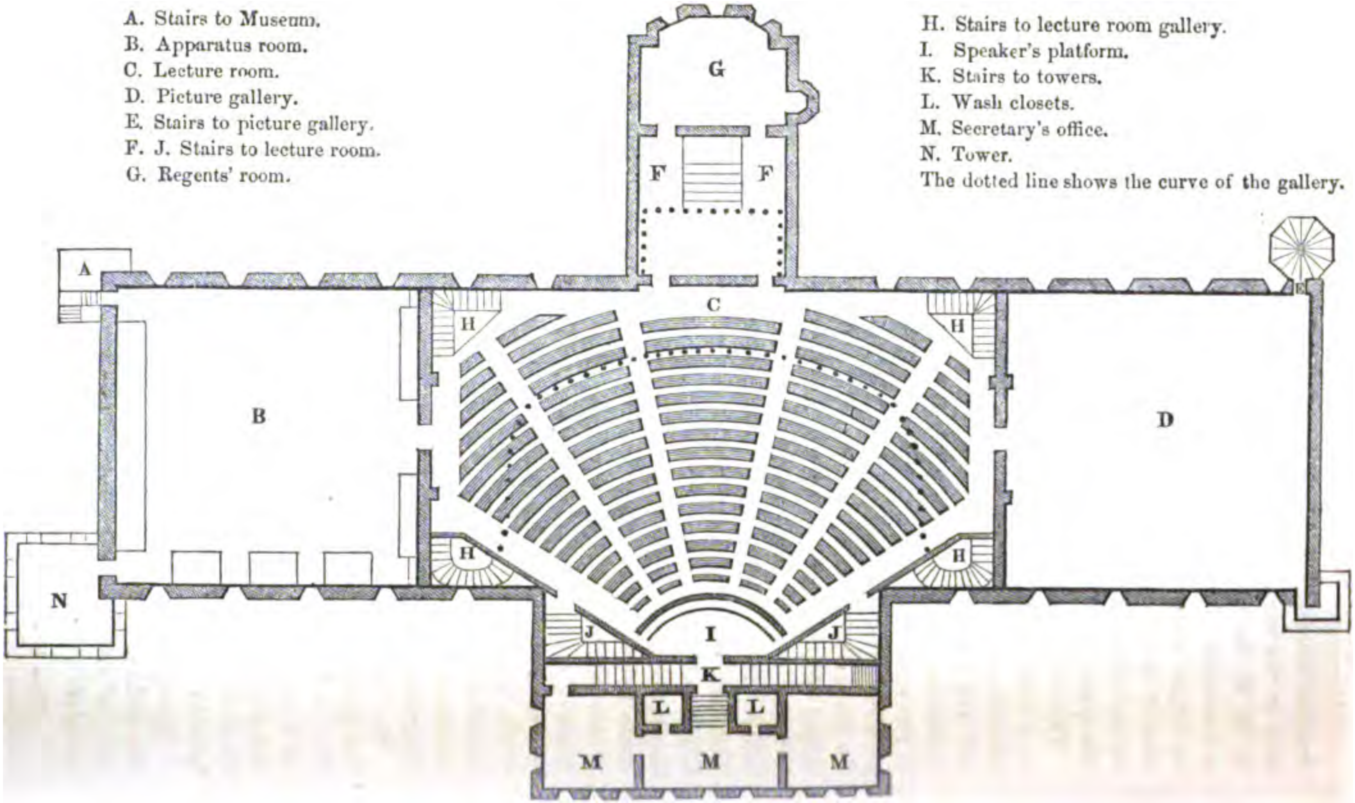
The following is a brief description of the lecture room, which has been constructed in accordance with the facts and principles stated in Professor Henry's memoir on this subject, so far at least as they could be applied.

There was another object kept in view in the construction of this room besides the accurate hearing, namely, the distinct seeing. It was desirable that every person should have an opportunity of seeing the experiments which might be performed, as well as of hearing distinctly the explanation of them.

By a fortunate coincidence of principle, it happens that the arrangements for insuring unobstructed sight do not interfere with those necessary for distinct hearing.

The law of Congress authorizing the establishment of the Smithsonian Institution directed that a lecture-room should be provided; and accordingly in the first plan one-half of the first story of the main building was devoted to this purpose. It was found, however, impossible to construct a room on acoustic principles in this part of the building, which was necessarily occupied by two rows of columns. The only suitable place which could be found was, therefore, on the second floor. The main building is two hundred feet long and fifty feet wide; but by placing the lecture-room in the middle of the story a greater width was obtained by means of the projecting towers.

The general form and arrangement of the room will be understood



A. Stairs to Museum.
B. Apparatus room.
C. Lecture room.
D. Picture gallery.
E. Stairs to picture gallery.
F. J. Stairs to lecture room.
G. Regents' room.

H. Stairs to lecture room gallery.
I. Speaker's platform.
K. Stairs to towers.
L. Wash closets.
M. Secretary's office.
N. Tower.
The dotted line shows the curve of the gallery.

from the accompanying drawing, which exhibits a plan of the second story of the main building. In this, G, F, F, represent the rear, and M, M, M, the front towers. The lecture-room is 100 feet in its greater dimension, 64 feet from I to C, and 88 feet to the extremity of the upper gallery F, F, The curved dotted line represents the front of the gallery, which is in the form of a horse shoe. The dotted line in the rear tower represents the extension of the gallery into this space.

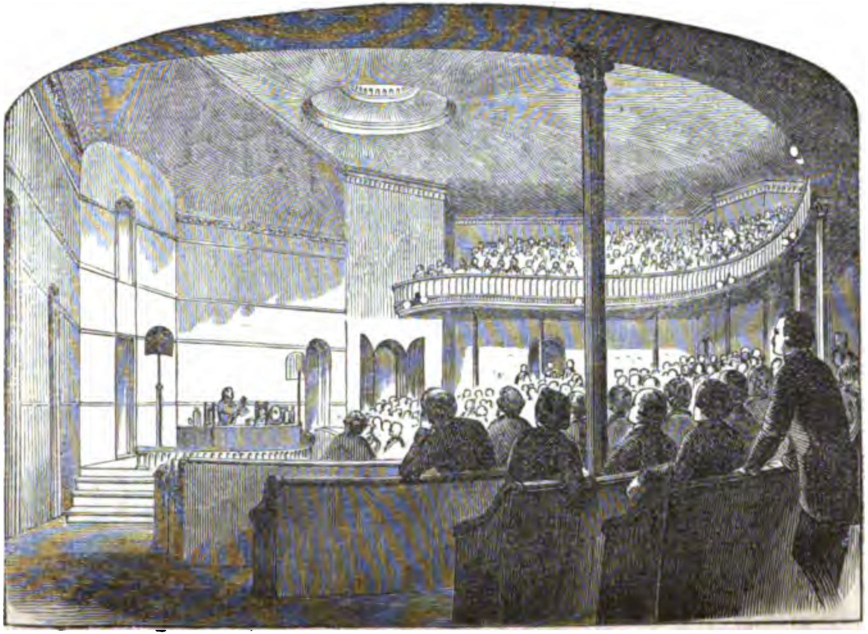
The second illustration exhibits a perspective view of the lecture-room from the west side under the gallery; and, when viewed along with the ground plan, shows better than any description could do, how well the second requisite has been accomplished: that every person should have an opportunity of seeing, as well as of hearing distinctly.

The speaker's platform is placed between two oblique walls. The corners of the room which are cut off by these walls afford recesses for the stairs into the galleries. The opposite corners are also partitioned off, so as to afford recesses for the same purpose. The ceiling is twenty-five feet high, and, therefore, within the limit of perceptibility. It is perfectly smooth and unbroken, with the exception of an oval opening nearly over the speaker's platform, through which light is admitted. The seats are arranged in curves, and were intended to rise in accordance with the *panoptic curve*, originally proposed by Professor Bache, which enables each individual to see over the head of the person immediately in front of him. The original form of the room, however, did not allow of this intention being fully realized, and therefore the rise is a little less than the curve would indicate.

The walls behind the speaker are composed of lath and plaster, and therefore have a tendency to give a more intense, though less prolonged sound than if of solid masonry. They are also arranged for exhibiting drawings to the best advantage.

The general appearance of the room is somewhat fan-shaped, and the speaker is placed as it were in the mouth of an immense trumpet. The sound directly from his voice, and that from reflection immediately behind him, is thrown forward upon the audience; and as the difference of distance travelled by the two rays is much within the limit of perceptibility, no confusion is produced by direct and reflected sound.

Again, on account of the oblique walls behind the speaker, and the multitude of surfaces, including the gallery, pillars, stair-screens, &c., as well as the audience, directly in front, all reverberation is stopped.



LECTURE ROOM, SMITHSONIAN INSTITUTION.

No echo is given off from the ceiling, for this is also within the limit of perceptibility, while it assists the hearing in the gallery by the reflection to that place of the oblique rays.

The architecture of this room is due to Captain Alexander, of the corps of topographical engineers. He fully appreciated all the principles of sound given by Professor Henry, as detailed in the former paper on "Acoustics applied to Public Buildings," and varied his plans until all the required conditions, as far as possible, were fulfilled.

LEGENDS AND TRADITIONS OF THE ODAHWAH INDIANS.

BY F. ASSIKINACK, A WARRIOR OF THE ODAHWAHS.*

Read before the Canadian Institute, December, 1857.

As it is my purpose to relate some Indian traditions, and make a few general observations concerning the Indian race of America, it may be proper to state that the Odahwah Indians are the tribe to which I myself belong. Some members of this tribe now reside on the Manitoulin Island in Lake Huron; others on the shores of Lake Michigan, in the State of the same name. The Odahwah settlement in that State is about forty miles in a south-westerly direction from the strait of Michinimakinang, which unites Lakes Michigan and Huron. That territory was wrested from the Mushkodensh tribe by the Odahwahs some two hundred and fifty years ago, and held by them until it was surrendered to the American government so recently

* Francis Assikinack, the author of this paper, is a full-blood Indian, and a son of one of the Chiefs of the Odahwahs,—or Ottawas, as they are more generally designated,—now settled on the Manitoulin Island in Lake Huron. In 1840, he was sent, at the age of sixteen, to Upper Canada College, Toronto, by the late Samuel P. Jarvis, Esq., then Superintendent-General of Indian affairs. At that time he was totally ignorant of the English language, and after being about three months at the above institution, he got one of the boys (now the Rev. G. A. Anderson of Tayendinaga,) to interpret for him, and solicit permission to return home, as he thought he could never learn the English language. Fortunately his desire was not complied with, and he remained long enough at Upper Canada College, not only to acquire such a command of the English language as is evinced by this communication on the Legends and Traditions of his Tribe, but also to obtain a familiar knowledge of Latin and Greek. F. Assikinack now fills the office of Interpreter in the Indian Department at Cobourg. So creditable and satisfactory a result of an experiment which at first seemed so hopeless, ought surely to encourage its repetition, and that on a much more extended scale.

I believe as the year 1830. A few years after this surrender many of them commenced to emigrate to and reoccupy Manitoulin Island. Why they have preferred going to this place I shall endeavour to explain in a subsequent paper, when I have occasion to speak about the name of that Island.

Before proceeding with my subject, I feel bound to solicit the readers' kind forbearance for the many faults which will naturally arise, in the course of these statements, from my imperfect acquaintance with the English language.

With such knowledge as education has placed within my reach I have been tempted, at times, to indulge in speculations relative to the origin of our own portion of the human race spread over the face of this western world; and who were found in possession of its boundless forests on its discovery by men from the other side of the Atlantic more than three hundred years ago. But, omitting much which I had designed to say, I may be permitted to remark, that wandering Asiatic tribes crossing to the north-east of the old continent would at length reach the sea at Behring straits. Having reached East Cape, they could have no great difficulty in going over to the opposite shores; the channel which runs between that part of Asia and America being only about forty miles wide, and, with the exception of the accumulation of ice, or ice mountains sailing through it occasionally, I believe the dangers to be met with are not greater than those to be encountered in other similar bodies of water. Besides, I believe, there are geological proofs of violent earthquakes having altered the features of particular localities, the encroachments of the sea upon tracts of land, elevations of islands, &c.; it is not therefore altogether improbable that Asia and America were once contiguous. But a necessary purpose having been accomplished, a convulsion of nature, in course of time, might have torn and sunk the land which held the two continents together, and which had served as a bridge for the vast multitude of human beings who came to people this portion of the Globe, as well as for the innumerable quadrupeds which must have continued for year and years to invade the boundless tracts of the western hemisphere after the general deluge. Permit me further to remark that it would appear from the map of the world, besides minor ones, there were originally three most remarkable chains, if I may so speak, which united and held fast the grand divisions of the earth, two of which are still in existence, namely, the Isthmus of Panama, the Isthmus of Suez, and another across Behring Straits, which, it would

seem, was snapped and sunk for the purpose of affording greater conveniences to modern navigation and enterprize.

I think this was the principal road by which man and other creatures were brought into this continent, I do not of course mean that there were no other ways and means by which emigration into this country might have been effected; I have no doubt that America was visited from time to time long before this, by hunters and adventurers from the Asiatic coast.

It would appear then, according to the opinion which I have taken the liberty to offer, that my ancestors entered America on the north-western point, commonly known at the present day as "Russian America."

The reader will now be pleased to bear in mind, that the few simple statements which I am about to lay before him, are not taken from information obtained by reading, but entirely from what I have learned casually from the Indians themselves in my younger days, when, I regret to say, I was in no way particularly anxious to obtain information. Neither had I the least idea of what use could be made of the old "Ahsokah nayahk," or legends. In the following narrative I shall confine myself to the traditions of my own people, viz.: the Odahwah Indians. It would appear, that in the earliest times to which it is possible to reach by tradition, this vast territory was inhabited by a race of men, said to be descended from one common stock, who were divided into tribes, each being independent and ruling over its own particular district. Living by the chase and on the spontaneous productions of the soil: we may nevertheless suppose, from their mentioning wooden hoes and corn cakes, that they also cultivated the soil to some extent. To give an idea how numerous the tribes were I shall name here a few, viz.: The Wahbahnahkiang, Nodoweg, Odushkwahguhmig, Assigahnayak, Obahnongoog, Omissahgig, Ojahwahnoog, Omahmeeg, Odahgahmeeg, Odahwahg, Ojibwag, Mushkodenshug, Omahnomineeg, Winibigoog, Osahgeeg, Podawahdahmeeg, Kigahboog, Nahdowassiwahg, Nabahgindibag, Oshushug, Kahshkahshkiang, Ahkewawigiwashmahg, Mahkahdaonahsahdahyang, Tchiboyahnug, and others, which I think it would require an extra sheet to enumerate. Each of these tribes had to maintain a small sovereignty of its own and for its own use. The members of the neighbouring tribes had no right to go beyond the limits of their respective districts on their hunting excursions, and encroach upon that belonging to others. Any hunter that was caught trespassing upon the rights of other tribes, or taking beaver in the rivers running through their lands,

was in danger of forfeiting his life on the spot for his rashness, and had much to do to elude his pursuers, if he was fortunate enough to escape their deadly weapons in the first hostile encounter. Things went on in this manner until the several states were obliged to declare open hostilities against each other in order to protect their rights the better. From this time they were engaged in constant warfare, more particularly against their immediate neighbours. The Indians say, this warlike attitude among the various tribes in the old times was occasioned rather by the force of circumstances than by the mere love of slaughter or warlike enterprise; that it was not altogether a war of extermination or conquest, and it would appear from their statements that the practice of carrying on cruel exterminating wars was adopted after the discovery of America by the Europeans. In fact, it was introduced by them, and great care was taken in their treaties with the Indians to induce them to adopt this sanguinary policy as a punishment to be inflicted upon any offending tribe. The Omahmee Indians in the vicinity of Omahmee River, on the coast of Lake Erie, were subjected to this severity, because they had ill-treated some traders, and at the instigation of the French they were attacked by several tribes. Although single handed the poor brave fellows held out for three months; yet, being then reduced to great straits by famine and by overwhelming numbers, the few survivors of that once powerful tribe came out and begged the besiegers not to devour the whole of the Omahmee nation. It is said, that out of the whole tribe only five families escaped this indiscriminate slaughter. The warfare then in which the Indian tribes were constantly engaged previous to the discovery of America in the fifteenth century, was begun and carried on for the sake of self-preservation. For such a state of things was considered necessary, inasmuch as a universal peace would have given too much liberty to the hunters, who would have overrun the country and in a short time killed off the animals, upon which the whole population depended for their chief subsistence and clothing. But the keeping up of hostilities by the various tribes against one another had the desired effect of preventing trespass upon their rights respectively, and causing their respective members to avoid as much as possible the frontiers for fear of meeting an enemy. The borders being thus left unmolested by the restless huuter, they were looked upon as neutral grounds, where the animals might resort and breed freely, whence the neighbouring districts might be supplied with game in abundance for the use of the inhabitants.

These are the reasons assigned by tradition for the continual wars

carried on among the Indian tribes in the early times. By the way, it is curious to notice, that tribes whose territories were far separated from one another were, in many instances, upon the best possible terms.

Generally speaking it may be said that the inhabitants dwelt in villages, and their favorite seats appear to have been eminences on the borders of lakes, and along the banks of rivers, so that in case of a hostile invasion they would have only one side of their village to defend and not be cut off from the supply of water. The villages of contending tribes were often within sight of each other. Notwithstanding the precaution to prevent their being surrounded, the villagers were often obliged to meet the enemy on the water in their canoes, made of elm bark or hide; and they thought as much of their naval engagements and victories as the navy of England of their achievements at the present day. It was customary to give a new name to the warrior who had distinguished himself most in their naval battles, as an honor and reward for his daring deeds, and to commemorate the event.

We have already noticed how the inhabitants were divided into tribes; and I may here state that a tribe was again subdivided into sections or families according to their "Ododams;" that is their devices, signs, or what may be called according to the usage of civilized communities, "Coats of Arms." The members of a particular family kept themselves distinct, at least nominally, from the other members of the tribe; and in their large villages, all people claiming to belong to the same Ododam or sign, were required to dwell in that section of the village set apart for them specially, which, from the mention of gates, we may suppose, was enclosed by pickets or some sort of fence. At the principal entrance into this enclosure, there was the figure of an animal or some other sign, set up on the top of one of the posts. By means of this sign every body might know to what particular family the inhabitants of that quarter claimed to belong. For instance, those whose Ododam was the bear would set up the figure of that animal at their principal gate. Some of the families were called after their Ododam. For example: those who had the gull for their ododam, were called the gull family, or simply the Gulls; they would of course put up the figure of that bird at their gate. Others did not adopt this custom; for instance, the family who set up the bear were called the "Big feet." Many of the village gates must have been adorned with very curious carvings, in consequence of parts only of different animals being frequently joined together to make up the ensigns armorial of a

family. For instance, the ododam of one particular section consisted of the wing of a small hawk and the fins of a sturgeon.

Some of the families were more influential than others, and it was necessary to obtain their consent before a council could be convened in which matters of importance were to be discussed. Others again were distinguished for their bravery or eloquence, and not a few for their filibustering propensities. There was one head chief recognized by the whole tribe, but his authority was merely nominal, the several families being placed under the authority and supervision of their respective chiefs. It was expected of a chief, that in order to maintain the dignity of his office and secure the respect and confidence of his people, he should be generous, brave, able to speak well, and avoid foolish talking; but above all, to have no feelings for himself—people might abuse him and say many things against him, but it was thought beneath his dignity to take any notice of what they said. This is the substance of the instructions given by an old chief when he resigned in favor of his son or some younger relative of his. There were two sorts of chiefs, namely, the war chiefs, and what may be called the civil chiefs, the former possessed a greater influence than the latter, and were really brave men, judiciously selected from the different families. In ordinary times the civil chiefs were left to manage the affairs of the tribe, but on extraordinary occasions the war chiefs were required to assist the other chiefs and exercise their influence. For instance, in matters of dispute with another tribe, which were likely to end in breaking off the friendly relations between the two tribes, if not satisfactorily arranged, it was, in the first place, the duty of the civil chiefs to use their best endeavors to settle the matter in dispute amicably, but if the other tribe persisted in refusing to listen to any reasonable terms, the matter was handed over to the war chiefs for decision, who at once met in council, selected a few of their number and sent them to the obstinate tribe to demand peace or war. If the deputation returned with words of peace, all was right; but if otherwise, all friendly intercourse ceased, and each prepared for war; and, if I recollect right, it was customary to permit the women, in cases of intermarriage, to return to their own tribe, if they wished to do so.

Having said this much about the social conditions of the Indian tribes and their relations one towards another in the early times, I shall now endeavor to give a brief account of their notions concerning the supernatural world, or what may be called their mythology, and relate some fragments of old legends, in which, I think, there are a few grains of truth to be found relating to the great events recorded

in sacred history. Here I would take the liberty to remark that, historians seem to think that the old legends of a nation, however fanciful and absurd they may appear to us, are by no means devoid of truth and that we ought not to throw them aside as useless fictions, without examining them closely first, to see if we cannot discover some historical truth therein, as it is only by means of traditions and legends that the early history of a nation can be divined.

Notwithstanding the belief of the Indians of America in the existence of many gods, they acknowledge but one Supreme Being. They believe this Supreme God to be all powerful, all knowing, infinitely perfect and invisible. So far as it is possible to ascertain by verbal information as furnished by the Indians themselves in this part of America, this Supreme Being was never represented under any corporeal figure. The idea that he was subject to any imperfection appears never to have entered into their heads; and He was supposed to preside over the whole world, nothing escaping his eye. From this it is evident that their notion of the Supreme Being was far superior to that of the ancient Romans and Greeks, respecting their Jupiter and Zeus, whom their poets did not hesitate to represent as beings subject to all the passions and frailties of human nature.

It is true that the Indians sometimes introduced the name of the Lord of the Universe into their war songs. They did so, not with levity, but in a solemn manner and in token of their submission to His will, whatever might happen to them in the warlike enterprise in which they were about to engage.

I think they had a pretty correct idea of the doctrine of Omnipresence, for they were careful to impress upon the minds of their children that the Great Spirit was above their heads, watching over them continually; and in order to have them properly instructed in their duties towards their parents and neighbors, a certain number of discreet aged people were selected to exhort the children in the evening. To the residences of these instructors the children repaired after their work was done, where they received good counsel and caution against doing evil. They were made to understand that however careful they might be to avoid suspicion or detection when doing injury to a neighbor, the Great Spirit would see all their actions, who was always near them. That if they incurred his displeasure, they had no right to expect any favors from him, as He withheld his good gifts from those who took delight in creating discord by calumny, and in tormenting others by means of jugglery and poisonous weeds. That they were to respect and obey their parents, that they might put to shame the evil spirit

who was always at hand tempting children to disobey and vex their parents, and who, whenever he succeeded in his wicked endeavors made all sorts of faces to them, though they did not see him, rejoicing for having gained victory over them; but as often as they resisted him successfully, he went away skulking, covered with shame and confusion, whilst the Great Spirit was pleased.

The children were also taught to show respect to old people; that as it was not in the power of man to prolong his life, it was by special favor that some people lived longer than others; that if such cursed those who despised and illtreated them in their old age, their petition would be heard by the Absolute Master of life; on the contrary their good wishes would be attended with happy results.

As regards the inferior divinities: some were supposed to dwell in the sky and clouds, some in mountains, and others in lakes, rivers, and in the subterranean passages which were said to lead from the deep parts of lakes into the bowels of the earth. Some of these inhabiting the watery caverns were supposed to be extremely malicious, always seeking to destroy the human beings who might happen to be on the water in the time of storms, instead of protecting them.

The Thunders, conscious of their irresistible strength, were considered to be generous, always ready to afford their strong protection to mankind; consequently the dreadful water monsters, and the terrible gods in the clouds were represented to be at perpetual enmity. The Thunders, of course, by fiery darts, always vanquished their opponents in the water, but they had to slay them eight times before they could finally kill them. If any person was killed by lightning it was said to be merely accidental, seeing that when the hideous monsters in the earth and water were routed and hotly pursued, they usually took refuge and hid themselves in the subterranean passages directly under the spot inhabited by men, and in their endeavors to dislodge them, the Thunders missed sometimes their aim and thus struck their own friends. When overtaken by a hurricane in the water, the Indians invoked some sea god to interfere in their behalf, throwing a piece of tobacco into the water at the same time, or a little dog with a stone tied to its neck. In dry seasons they called upon the Thunders to bring down rain; also when they were surrounded and reduced to great straits in war, that the rain might slacken the bow strings and render them useless, when of course both parties would be obliged to cease fighting.

To the Thunders and other inferior deities they occasionally offered sacrifices, but instead of consuming the victim by fire or otherwise

wasting it, they cooked or roasted and devoured the animal themselves, singing, dancing, and beating the drum during the feast.

The following are a few fragments of Indian legends. Although they do not appear to have had any distinct notion of the creation, still their idea of the dignity of human nature seems to have been higher than that entertained by those ancient and modern philosophers who would have us believe that the lowest state of barbarism was the primitive condition of man; that the first human beings sprung, in the condition of mere animals, from the earth, going about upon their hands and feet: mute, filthy, acorn-eating savages, until from constant fighting, scratching and what not, they learned to stand erect, and walked upon their feet. So far from there having been any such notion among the Odahwahs, Ojibways and their neighbors, tradition told them that the first human beings came from above, which is certainly not altogether at variance with the Bible doctrine regarding the origin of man.

As regards the flood, the story runs as follows: A celebrated demigod came to reside with men for some time. He is styled Nanahboozho, and possessed the power of doing wonders. In the course of his stay with men, he one time fixed his winter-quarters near a certain lake; but he was not long there before he became aware that malignant monsters dwelt in the lake. He therefore carefully cautioned his favorite son, Wolf, not to go upon the ice lest some misfortune happen to him; but told him always to come by land when returning from his hunting rounds. The young Wolf acted for some time upon the advice of his sire, until one evening as he was returning from the chase, he reached the margin of the fatal lake, directly opposite his father's camp; and being much fatigued and hungry, and it being very late in the evening, he thought it would be too much trouble, and take too long to go round by land, so after a few moments hesitation he ventured upon the ice and made for the opposite shores; but when he got about half way, he heard a rumbling noise and the ice began to be elevated in different parts of the lake. The young hunter being terrified, ran for his life; but before he reached the land, death overtook him amid the broken fragments of ice, and he found his grave beneath the waters.

The father being deeply grieved for the loss of his favorite son, vowed vengeance upon the destroyers of his life, and determined to watch for a favorable opportunity during the hot days of the ensuing summer, when the cruel monsters would emerge occasionally from their dismal abode in the deep to come and enjoy the sunshine upon

the sandy beach. Snow and ice disappeared. Warm weather came. When the proper time arrived, the father took his bow and quiver one fine morning, and repaired to the lake. Having chosen a convenient spot near the sandy beach, he there took up his position, and in order to avoid detection, transformed himself into an old pine tree scorched all over. About noon the sea gods appeared on the surface, and after having carefully surveyed their pleasure ground and its vicinity, and perceiving no danger, swam towards the shore, landed, and reclined upon the sand. But not being used to sunshine, they were soon overpowered by the heat, and fell into a deep sleep. The father had now the power of inflicting a deadly wound upon any of them, so he quietly bent his bow, took a deliberate aim, and let fly his flint-pointed arrow into the side of one of the slumbering monsters.

The water deities being thus startled from their pleasant repose, and finding one of their compeers terribly wounded, were driven in their rage beyond all bounds. They immediately plunged into the deep and commenced to agitate the waters, which soon overflowed the banks of the lake, sending forth floods in all directions, sweeping everything before them, until the whole earth was buried under water. In the meantime, Nanahboozho perceiving his perilous situation, took refuge on the highest point of the earth, but the flood came up to him rapidly; he then got upon a pine log that was floating by, being the only means within his reach by which he could save himself from immediate destruction. Sitting upon this log he was driven and tossed about by the fury of the elements until at length they exhausted their rage, then the waters became still.

As soon as the fair weather commenced, Nanahboozho took into his consideration various schemes by which he might be enabled to recover the lost world. Whilst meditating deeply, he happened to notice a muskrat that was on his log canoe, he forthwith commanded the animal to dive and endeavor to bring up a piece of mud from the bottom. The muskrat plunged at once into the water and went down; after a long time he came up to the surface apparently dead. His master took him up, and on examining the arms of the animal, he found a lump of clay under one of the shoulders; this lump he pressed between his hands, and when he made it very thin, he carefully placed it upon the surface of the water. This piece of mud became a large island in the course of a few days, which continued to increase until the earth was formed as we have it now. The new earth again became the habitation of human beings, covered with luxuriant verdure, and furnished with other necessaries for the use of man and

other animals. It is remarked that the surface of the new earth was perfectly level in its commencement, but, in the course of its formation, an enormous beast arose from the ocean, and came upon the land where he began to paw and otherwise disfigure the surface. The earth being then quite soft, he made lasting impressions, hence we have mountains and deep vallies. Nanahboozho is said to have been of a gigantic stature; of a happy and kind disposition. He continued to reside with men for some time after the flood, the great part of his time being employed in instructing them in the use of many things necessary for their well-being. He then told them that he was going away from them; that he would fix his permanent residence in the north, and that he would never cease to take deep interest in their welfare. As a proof of his regard for mankind, he assured them that he would from time to time raise a large fire, the reflection of which should be visible to them. Hence the northern lights are regarded by the Indians as the reflection of the great fire kindled occasionally for the purpose of reminding them of the assurances made to them by their benefactor.

With regard to the unity and dispersion of the human race. The Indians appear also to have had some notions of their own on the subject. The story is short and simple, but sufficiently clear in its own way; and, I may observe, nearly the same story is current with almost every tribe. It is as follows:—

The tribes were one and the same people in the beginning; but at a certain point of time, their ancestors had a great dispute. The cause of that dispute was the foot of a bear, and when they could not make up their differences, they quietly dispersed in different directions, and their children became distinct nations under different names.

One more legend, and I shall close my present writing. It is usually told nearly as follows, viz.:—Several brothers, or a body of men of the tribe, were being pursued and hard pressed by fierce enemies, and being driven to the ends of the earth, when it was impossible for them to retreat any further, one of them suddenly turned round and struck the earth with his stick, which immediately opening, all their pursuers were swallowed up in the yawning abyss, the earth closed again, and thus saved his companions from death.

This legend, heard by me in childhood, has almost entirely escaped my memory since, and I can only relate the substance of it. I have sometimes thought of it in after times, and wondered whether it might not possibly be a tradition, giving an Indian account of the tribes of the Israelites when overtaken by the pursuing armies of Pharaoh, and the drowning of the Egyptians by the waters of the Red Sea.

ON THE ACTION OF AIR ON ALKALIC ARSENITES.

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Read before the Canadian Institute, January, 1858.

It is well known that a solution of arsenite of soda has been employed of late years as an important agent in volumetric analysis, especially in the determination of the value of chloride of lime. Fresenius (Chemical Gazette, No. 300,) has objected to this process, that the alkalic arsenite when in solution is liable to oxidation, and that by exposure to the air a notable quantity of the arseniate is formed, which of course interferes with the accuracy of the volumetric determination.

He states that a freshly prepared solution of arsenite of soda gives the usual pale yellow precipitate with nitrate of silver, but that with a solution which has been exposed for some time, a precipitate having a brown tinge is obtained, and he affirms that nearly the whole of the arsenious acid is converted into arsenic in the course of three weeks, if the bottle in which the alkalic solution is contained be opened rather frequently. He also detected the presence of arseniate in Fowler's solution, a fact which is of some importance in a medicinal point of view.

On the other hand, Mohr, (to whom we are indebted for most important improvements in this very elegant branch of chemical analysis,) denies the oxidation of the liquor arsenicalis, and also of the arsenite of soda in presence of excess of carbonate, and by volumetric experiments with a solution of the arsenite mixed with starch and a normal solution of iodine in iodide of potassium, he proved that no change had taken place in a solution which had been kept ten months. He states that this latter solution gave, with nitrate of silver, a pure canary yellow precipitate, without any admixture of brown.

The following experiments, without fully clearing up the difficulty, at least exhibit one of the causes of the discrepancies in the statements of the above mentioned eminent chemists.

The formation of a pure canary yellow coloured precipitate in a solution of an alkalic arsenite, is no proof that an arseniate is not present. If 99 parts of arsenious acid be mixed with 1 part of arsenic acid, and dissolved in potassa, the solution carefully neutralized with

acetic acid and then tested with nitrate of silver, a pure yellow precipitate is produced without a trace of brown, and the same is the case if the amount of arsenic acid be increased even to five per cent. Beyond that quantity the brownish red tint becomes perceptible.

But if to the solution in which the yellow precipitate has been formed, very dilute nitric acid be cautiously added, drop by drop, the arsenite of silver being more readily soluble in nitric acid than the arseniate, will dissolve first, and leave the latter with its characteristic color. The smallest excess of nitric acid, however, dissolves the arseniate and destroys the experiment. By adding ammonia and again trying the nitric acid we can almost always succeed in producing the red color. That the nitric acid employed in the process exerts no oxidizing action on the arsenious acid is easily proved by using a pure arsenite, when no trace of brown coloration can be obtained.

Instead of nitric acid we may employ acetic, in which the arsenite of silver is readily soluble, but the arseniate quite or nearly insoluble. With either acid, however, it is somewhat difficult to detect the presence of the arsenic acid when it does not amount to more than one per cent. When ten per cent. of arseniate is present the brownish red color is produced immediately; with seven per cent. the color is fainter, and with five per cent. the precipitate is so nearly pure yellow that no safe conclusions can be drawn as to the presence of arsenic acid from the color alone.

Solutions of equal quantities of arsenious acid in potassa, carbonate and bicarbonate of potassa, carbonate of soda, bicarbonate and caustic soda, were prepared twelve months ago, with a view to some experiments on this subject, but have remained untouched until the present time, the last two being unfortunately lost. They were all freely exposed to the air, but in neither of the first four cases could any brown coloration be detected on neutralizing with acetic acid, and precipitating by nitrate of silver. In all of them, however, the arseniate was readily detected by the process above described, thus confirming, as might have been expected, the results of that most accurate analyst, Fresenius.

While the oxidation of the arsenious acid was thus clearly proved, the amount converted into arsenic acid was found to be exceedingly small, and what is most remarkable is, that the solution in bicarbonate of potassa showed a much larger proportion of arseniate than either of the others, but in no case was the quantity very large, herein differing from Fresenius' experiments.

The following experiments were made with the view of confirming Fresenius' statement with regard to the rapid oxidation of arsenite of soda:

Equal quantities of arsenious acid were dissolved in potassa, soda, and their bicarbonates, the latter being used in excess. After free exposure to the air for three weeks it was found that all the solutions gave a pure canary yellow precipitate with nitrate of silver, but that in the case of the soda solution the presence of an appreciable quantity of arseniate could be detected by using nitric or acetic acid in the manner above mentioned. The potassa solution gave an exceedingly faint, almost imperceptible, trace of arseniate; and the same was the case with the bicarbonate solutions. Portions of these liquids which had been kept in close stoppered bottles gave of course no indication of arseniate. From comparative experiments the quantity of arseniate in the soda solution was estimated at between two and three per cent., a result which differs most unaccountably from that obtained by Fresenius.

From these experiments it would appear that, contrary to Mohr's statements, oxidation does take place in solutions of alkalic arsenites exposed to the air, but that the amount of oxidation is in most cases so small as not to interfere with the employment of such solutions in accurate volumetric experiments, unless under such abnormal and unknown conditions as apparently occured in Fresenius' experiments.

It would seem therefore advisable in preparing solutions for such purposes to adopt Mohr's suggestion, viz., to acidulate the arsenite of soda solution with sulphuric acid, and then to dilute to one litre (or other measure), and before using the solution to supersaturate with carbonate of soda. All oxidation would thus be prevented, as free arsenious acid in solution does not pass into arsenic acid. A solution which had been very frequently exposed to the air for the last six years, showed no trace of the latter.

From experiments made since the above was written it would appear that the use of acetic acid in this mode of testing is far preferable to nitric acid, the least excess of which dissolves the arseniate. If a considerable excess of acetic acid, containing about twenty per cent., be added to the precipitate, the arsenite dissolves, and the arseniate separates as a light floculent matter on the surface, exhibiting very distinctly the brown color. In this manner less than one per cent. can be readily detected. Experiments made on some of Fowler's solution, which had been kept two months, discovered slight traces of arseniate. It would be interesting to ascertain under what circumstances Fresenius' experiments were made; in the above, in which so very little oxidation took place, the solutions in potash and soda were made as neutral as possible.

REVIEWS.

The Englishwoman in America. London: John Murray, 1856.

This pleasantly written sketch of an Englishwoman's first impressions of British North America and the United States, has lain by us, for the purpose of review, till it has almost fallen out of date. The book is a good book, however; candid and vivacious, and containing some glimpses of things as they they are, which may still be worth noticing for behoof of Canadian readers. In her prefatory remarks our travelling "Englishwoman" observes:

"Previously to visiting the United States, I had read most of the American travels which had been published; yet, from experience, I can say that even those who read most on the Americans know little of them, from the disposition which leads travellers to seize and dwell upon the ludicrous points which continually present themselves.

"We know that there is a vast continent across the Atlantic, first discovered by a Genoese sailing under the Spanish flag, and that for many years past it has swallowed up thousands of the hardiest of our population. Although our feelings are not particularly fraternal, we give the people inhabiting this continent the national cognomen of '*Brother Jonathan,*' while we name individuals '*Yankees.*' We know that they are famous for smoking, spitting, 'gouging,' and bowie knives; for monster hotels, steamboat explosions, railway collisions, and repudiated debts. It is believed also that this nation is renowned for keeping three millions of Africans in slavery; for wooden nutmegs, paper money, and 'fillibuster' expeditions.

"I went to the States with that amount of prejudice which seems the birthright of every English person, but I found that, under a knowledge of the Americans which can be attained by a traveller mixing in society in every grade, these prejudices gradually melted away. I found much that is worthy of commendation, even of imitation."

We detect, as might naturally be looked for under such circumstances, an occasional exageration of unprejudiced candor, and a tendency to regard all that pertains to the States as *couleur de rose,*—very pardonable in a lady traveller, who met with great kindness, and saw much which justly excited her surprise and admiration. We had marked various passages for quotation, illustrative of the aspect in which American society presents itself, under the most favorable circumstances, to an intelligent foreigner; but having been delayed in noticing the work, we shall limit our extracts chiefly to one or two glimpses of ourselves, showing how Colonial life and social manners pass under review, when candidly compared by a travelling "Englishwoman," alike with her own home experiences, and with what she

observed both in the old and the new States of the Union. And here is a lively and piquant illustration of the vein of humour with which the graphic pen of our authoress sketches off some of those racy encounters which every traveller in the New World must occasionally experience. As it is a sketch of British Colonial life and enterprise, it may serve as a taste of that species of traveller's tales, respecting ourselves, which has excited so much ire when applied to our neighbours across the border.

I cannot forbear giving a conversation which took place at a meal at this Inn, [The Waverly House, St. John, New Brunswick,] as it is very characteristic of the style of persons whom one continually meets with in travelling in these Colonies. 'I guess you're from the Old Country?' commenced my *vis-à-vis*; to which recognition of my nationality I humbly bowed. 'What do you think of us here down east?' 'I have been so short a time in these provinces, that I cannot form any just opinion.' 'Oh, but you must have formed some; we like to know what Old Country folks think of us.' Thus asked, I could not avoid making some reply, and said, 'I think there is a great want of systematic enterprise in these colonies; you do not avail yourselves of the great natural advantages which you possess.' 'Well, the fact is, old father Jackey Bull ought to help us, or let us go off on our own hook right entirely.' 'You have responsible government, and, to use your own phrase, you are on your own hook in all but the name.' 'Well, I guess as we are; *we're a long chalk above the Yankees.* Though them is fellers as thinks nobody's got their eye teeth cut but themselves.'

The self-complacent ignorance with which this remark was made was ludicrous in the extreme. He began again. "What do you think of Nova Scotia and the 'Blue Noses?' Halifax is a grand place, sure*ly*!" "At Halifax I found the best inn such a one as no respectable American would condescend to sleep at, and a town of shingles, with scarcely any side walks. The people were talking largely of railways and steamers, yet I travelled by the mail to Truro and Pictou in a conveyance that would scarcely have been tolerated in England two centuries ago. The people of Halifax possess the finest harbour in North America, yet they have no docks and scarcely any shipping. The Nova Scotians, it is known, have iron, coal, slate, limestone, and freestone, and their shores swarm with fish, yet they spend their time in talking about railways, docks, and the House of Assembly, and end by walking about doing nothing."

"Yes," chimed in a Boston sea-captain, who had been our fellow-passenger from Europe, and prided himself for being a "thorough-going down-easter." "It takes as long for a Blue Nose to put on his hat as for one of our free and enlightened citizens to go from Bosting to New *Orleens.* If we don't whip all creation it's a pity! Why, stranger, if you were to go to Connecticut and tell 'em what you've been telling this 'eer child, they'd guess you'd been with *Colonel Crockett.*"

"Well," I proceeded, in answer to another question from the New-Brunswicker, "if you wish to go to the north of your province, you require to go round Nova Scotia by sea. I understand that a railway to the Bay of Chaleur has been talked about, but I suppose it has ended where it began; and for want of a railway to Halifax, even the Canadian traffic has been diverted to Portland."

"We want to invest some of our surplus revenue," said the Captain. "It will be a good spec when Congress buys these colonies: some of our ten-horse power chaps will come down, and before you could whistle 'Yankee Doodle,' we'll have a canal to Bay Varte, with a town as big as Newhaven at each end. The Blue Noses will look kinder streaked then, I guess."

Our observant traveller visits in succession, the various British American Colonies, and while she sees much to admire and wonder at, in the evidence of enterprise and rapid progress, she also repeatedly finds occasion to draw comparisons between the eastern Colonies and the neighbouring States, not always very favorable to the former. She exhibits, indeed,—as an Englishwoman speaking of British Colonies,—some of that candor which a friend occasionally claims the liberty to indulge in: giving expression to truths more wholesome than pleasant, and relieving her mind thereby of some of the pent-up spirit of critical observation, which she has discovered might not be very well received by her American friends. Some of her colonial comments are certainly sufficiently plain spoken. After commending the summer beauty of Prince Edward Island, "The garden of British America," its highly favored climate, good wages, abundant employment, land cheap yet productive, wood plentiful, and the main occupation of the Islanders: ship-building, a most profitable trade; the reverse follows, in such an over-drawn picture of "the dull, cheerless, desolate winter," as the unexperienced invariably associate with our Canadian frosts and snows. We shall condense one or two of her piquant pencillings of Prince Edward Island:

Charlotte Town, the capital of the Island, and the Seat of Government, is very prettily situated on a capacious harbor. With the exception of Quebec it is considered the prettiest town in British America; but while Quebec is a city built on a rock, Charlotte Town closely borders upon a marsh, and its drainage has been very much neglected. . . . . The houses are small, and the stores by no means pretentious. The streets are unlighted, and destitute of side-walks; there is not an attempt at paving, and the grips across them are something fearful. 'Hold on' is a caution as frequently given as abolutely necessary. I have travelled over miles of corduroy road in a springless waggon, and in a lumber waggon drawn by oxen where there was no road at all, but I never experienced anything like the merciless, joint-dislocating jolting which I met with in Charlotte Town. This island Metropolis has two or three weekly papers of opposite sides in politics, *which vie with each other in gross personalities and scurrilous abuse.* . . . . The House of Assembly is said to be on a par with Irish poor-law guardian meetings for low personalities and vehement vituperation.

The genius of discord must look complacently on this land. Politics have been a fruitful source of quarrels, misrepresentation, alienation, and division. The opposition parties are locally designated *snatchers* and *snarlers*, and no love is lost between th two. It is broadly affirmed that half the people on the island

do not speak to the other half. And worse than all, religious differences have been brought up as engines wherewith to wreak political animosities. I never saw a community in which people appeared to hate each other so cordially. . . . . . The further you go from Charlotte Town the more primitive and hospitable the people become. They warmly welcome a stranger, and seem happy, moral, and contented. . . . . The difficulty in procuring servants is felt from the Government House downward. A servant left at an hour's notice, saying, 'she had never been so insulted before,' because her master requested her to put on shoes when she waited at table; and a gentleman was obliged to lie in bed because his servant had taken all his shirts to the wash, and had left them while she went to a 'frolic' with her lover.

The upper class of society in the island is rather exclusive, but it is difficult to say what qualification entitles a man to be received into 'Society.' The *entrée* at Government House is not sufficient; but a uniform is powerful, and wealth is omnipotent.

We wonder if any able editor of Charlotte Town has, as yet, availed himself of the opportunity of reviewing this highly flattering picture of himself, his brother editors, the Prince Edward citizens and their Metropolis, presented by our fair traveller to the world at large. If so, a peep at his style of treating the theme would not be without a certain spice of interest. But we must follow our enterprising observer to our Western Colonial settlements, accompanying her in her short cut through the States, where the following may serve as a sample of her experience in the cars:

"'You're from down east, I guess?' said a sharp nasal voice behind me. This was a supposition first made in the Portland cars, when I was at a loss to know what distinguishing and palpable peculiarity marked me as a 'down easter.' Better informed now, I replied, 'I am.' 'Going west?' 'Yes.' 'Travelling alone?' 'No.' 'Was you raised down east?' 'No, in the Old Country.' 'In the little old Island? Well, you are kinder glad to leave it, I guess? Are you a widow?' 'No.' 'Are you travelling on business?' 'No.' 'What business do you follow?' 'None.' 'Well, now, what are you travelling for?' 'Health and pleasure.' 'Well, now, I guess you're pretty considerable rich. Coming to settle out west, I suppose?' 'No, I'm going back at the end of the fall.' 'Well, now, if that's not a pretty tough hickory-nut! I guess you Britishers are the queerest critturs as ever was raised!'"

Thus pioneered on her way, our English traveller reached Toronto, in time to be present when the false despatch was received among us announcing the fall of Sebastopol; and she rejoices with genuine British feeling over the sympathy which the supposed triumph of the British Arms excited. But unhappily at that recent date Toronto was not so well provided with hotel accommodation as it has since become, and the authoress draws comparisons between the quarters travellers then found in Toronto and in the cities of the neighbouring States, not

very flattering to the former. Hamilton commands a larger attention, and is described in a more graphic manner than Toronto, perhaps for the very reason that it was less like what a British traveller is accustomed to at home. Such at least was manifestly the impression it produced in the present case:—

"Hamilton is, I think, the most bustling place in Canada. It is a very juvenile city, yet already has a population of twenty-five thousand people. The stores and hotels are handsome, and the streets are brilliantly lighted with gas. Hamilton has a peculiarly unfinished appearance. Indications of progress meet one on every side,—there are houses being built, and houses being pulled down to make room for larger and more substantial ones,—streets are being extended, and new ones are being staked out, and every external feature seems to be acquiring fresh and rapid development. People hurry about as if their lives depended on their speed. 'I guess,' and 'I calculate,' are frequently heard, together with 'Well posted up,' and 'a long chalk;' and locomotives and steamers whistle all day long. Hamilton is a very Americanized place; I heard of 'grievances, independence, and annexation,' and altogether should have supposed it to be on the other side of the boundary-line."

Ancaster, Dundas, Niagara, and other places of greater or less note in Upper Canada, are described with equal life and vivacity; and thereafter, Montreal, Quebec, and the *habitants* of Lower Canada, with the like evidences of the hastily formed impressions of an intelligent wayfarer. Clifton House, and the Canadian side of "The Falls," come in for a description too minute to be always complimentary. Our traveller "*did* the Falls" as thoroughly as any enterprising traveller could who had formed the resolution of being able to say she had done them; winding all up by going to the Rock House, donning a dress, which she pronounced on looking in the mirror, made her look "as complete a tatterdemallion as one could see begging upon an Irish highway," and thus attired she accomplished the feat of going behind the Falls, and reaching *Termination Rock*. A duly attested certificate rewarded her heroism, testifying to the fact "That Miss ——— has passed behind the Great Falling Sheet of Water to Termination Rock, being 230 feet behind the Great Horse Shoe Fall." This appeared so satisfactory a document to bear away from Niagara, that she was subsequently tempted to produce it to an American fellow-traveller in the cars, when he entirely upset her self-complacency, by pronouncing it "a sell right entirely, an almighty all-fired big flam!"

An interesting chapter is devoted to a statement of the capabilities and prospects of Canada, its climate, population, and attractions for emigrants. The impression produced on the writer's mind appears to have been altogether favourable; and with her concluding remarks on

this subject we shall close this hasty notice of a book which compares very favourably with the majority of travellers' notes on Canada and the States:

"Taken as a *whole*, the inhabitants of both Provinces are attached to England and England's rule; they receive the news of our reverses with sorrow, and our victories create a burst of enthusiasm from the shores of the St. Lawrence to those of Lake Superior. . . . . At present every obstacle to Canada's further development seems to be removed—her constitution has been remodelled within the last few years on an enlarged and liberal basis,—her religious endowments have been placed on a permanent footing. . . . . The sun of prosperity shines upon her from the Gulf of St. Lawrence to the distant shores of the Ottawa and the western lakes. She requires only for the future the blessing of God, so freely accorded to the nations which honor Him, to make her powerful. . . . . .
It may be that in future years our mighty nation shall go the way of all that have been before it; but whether the wise decrees of Providence doom it to flourish or decline, we can still look with confident hope to this noble Colony in the New World, believing that on her enlightened and happy shores, under the influence of beneficent institutions and of a Scriptural faith, the Anglo-Saxon race may renew the vigor of its youth, and realize in time to come, the brightest hopes which have ever been formed of England, in the New World."

D. W.

A Manual of the Detection of Poisons. By Dr. F. J. Otto. Baillière, New York, 1857.

In that invaluable handbook of chemistry, generally known by the name of the *Graham-Otto's Manual*, but which has been so much improved and enlarged in the last edition, that it must rank as an independent work, the author, Professor Otto of Brunswick, devotes a large space to the subject of the detection of arsenic in cases requiring medico-legal investigation. He has since published this portion of the work separately, adding a description of the modes of detecting the other more commonly occurring poisons, and has added a valuable chapter on the general process to be adopted in those cases where the nature of the poison is unknown or unsuspected, and the chemist is consequently obliged to search for all.

This little work, which has recently been translated by Dr. Elderhorst of Troy, N. Y., forms, we have no hesitation in saying, one of the most valuable contributions to the literature of practical chemistry that has appeared for many years. Professor Otto is well known as a most accomplished chemist and accurate experimenter, and being in high repute, and constantly employed as an analyst in medico-legal investigations, the various processes recommended in his work have all

been verified in his own laboratory; and implicit confidence may be placed in his statements, as they are not mere compilations or extracts, but the results of actual experience. The subject of arsenic occupies the larger portion of the book, being a more generally used poison, and the methods of elimination applying equally well to many other mineral substances. The processes are described in clear and intelligible language, the best and most characteristic tests put prominently forward, and the confirmatory experiments placed by themselves, thereby obviating the difficulty which students often feel in choosing from a large number of tests those which are most reliable. We cannot but think, however, that the *iodate of potash* test, for distinguishing arsenical from antimonial spots, is worthy of being placed among the most characteristic reactions.

Dr. Elderhorst has made some valuable additions, especially the chapter on Oxalic Acid, all mention of which had been omitted from the original work, through some unaccountable oversight; for although poisoning by oxalic acid is not now so frequent as formerly, yet cases do sometimes occur, arising generally from accident or carelessness.

In the chapter on Hydrocyanic Acid, the translator has inserted some very important and useful additions; but we think that mention should have been made of Taylor's experiments on the detection of prussic acid mixed with animal matter, even when in an advanced stage of putrifaction. The test employed was that of Liebig, and gave eminently successful results, and should therefore be tried in cases where the body has been buried some time, although there is undoubtedly but little chance of any appreciable trace of the acid remaining unvolatilized. In such cases, or where only the contents of the stomach have to be examined, this process is preferable to that of distillation. (See Chemical Gazette, 1847.)

Dr. Elderhorst adds to this chapter a description of the ordinary process for determining the quantity of prussic acid contained in any liquid, consisting of the precipitation of the acid by means of nitrate of silver, and calculation from the amount of cyanide obtained. This process is open to the objection that it requires careful manipulation, occupies a considerable time, and when hydrochloric acid is present, becomes very complicated. It is curious that Dr. Elderhorst did not mention the beautiful method of estimating prussic acid, proposed by Liebig. As this plan is so easy of execution, occupying only a few minutes, and as it may often be of great value to medical men who are sometimes in uncertainty respecting the strength of their prussic acid, we need scarcely offer an apology for introducing a description.

A tube (alkalimeter) capable of containing 1000 grains of water, is graduated into 100 parts, and marked, beginning from 0 above; 17 grains of nitrate of silver are put in, and the tube filled up to 0 with distilled water, the mouth closed with the thumb, and the tube agitated until solution has taken place, a few drops will adhere to the thumb, but these can be scraped off. Of the prussic acid to be examined, 54 grains are accurately weighed out, mixed with about an ounce of water, and an excess of solution of caustic potash added. A little common salt may also be added, but is not absolutely necessary. The nitrate of silver solution is now poured in until permanent turbidity is produced; the precipitate first formed dissolves on stirring, but when it is no longer taken up on continued agitation, the operation is finished. The number of divisions of the nitrate solution employed, are now read off, and each one of the 100 represents 0, 1, or one-tenth per cent. of anhydrous hydrocyanic acid. Suppose 28½ measure have been employed, then the liquid contains 2.85 per cent. of pure acid.

Under the head of Strychnine, the various tests are described, and the methods explained by which the alkaloid can be separated in the state of purity required for their success. The suspected substance is treated with alcohol and tartaric acid, the liquid evaporated, treated with water, and the aqueous solution mixed with ammonia, which sets the strychnine free; by agitation with ether it can be extracted. Since the publication of the above translation, chloroform has been recommended as a substitute for ether. The chloroform rapidly absorbs the strychnine, and settles to the bottom, it can be drawn off, mixed with twice its volume of alcohol, and this solution yields on evaporation very distinct and pure crystals of the alkaloid. This process seems to be an excellent one, and likely to supersede all others. Some experiments made in the writer's laboratory with one third of a grain of strychnine dissolved in one quart of beer, were eminently successful, and afforded sufficient pure substance to make several chromic acid tests.

We cannot too strongly recommend this excellent little work to the attention of working chemists, medical men, and all interested in chemico-legal investigations; and many thanks are due to Dr. Elderhorst, not only for his excellent translation, which contains very few Germanisms,—herein differing most favorably from some other American translations of chemical works,—but also for his own very valuable additions.

H C.

The Edinburgh Review. No. CCXVII. January, 1858. *American Edition:* Leonard Scott & Co., New York.

The London Quarterly Review. No. CCV. January, 1858. *American Edition:* Leonard Scott & Co., New York.

The Westminster Review. No. CXXXV. January, 1858. *American Edition;* Leonard Scott & Co., New York.

The North British Review. No. LIV. November, 1857. *American Edition:* Leonard Scott & Co., New York.

The review of a Review is a species of critical sharp shooting, only recognisable in the Republic of letters under very special circumstances, such as we do not claim to exist in the present case. It is not, therefore, our intention to criticise the *Edinburgh Review;* to analyse the modern phases of English conservatism as exhibited in the *London Quarterly;* to sit in judgment on the heterodoxies of the *Westminster;* or even to discuss the accuracy of what Messrs. Leonard Scott & Co., of New York, deem it "proper to say" relative to their younger northern rival: "that the 'North British,' which had recently become less evangelical than in its earlier years, has got back to its *first faith*, and is now conducted on the same principles and with the same vigor which characterized it when under the care of *Chalmers* and his illustrious compeers."

What we propose to notice at present is the existence and circulation of these American editions of the English literary and political Reviews. The politics of our English party organs appear, indeed, to puzzle their American editors, nearly as much as our home editors are put about to supply the precise English equivalents for such transatlantic party names as Dough-faces, Hard-shells, Clear-Grits, Know-nothings and a thousand other ingenious political figures of speech. After painful analysis, however, the American reëditor eliminates the following nice shades of distinction in the periodicals which, as their New York publishers' advertisement states, "represent the great political parties of Great Britain." "LONDON QUARTERLY: *Conservative.* EDINBURGH REVIEW: *Whig.* NORTH BRITISH: *Free Church.* WESTMINSTER: *Liberal.* BLACKWOOD: *Tory,*" or the "*embodied genius of Toryism.*" Unfortunately the precision of such definitions is somewhat marred by the geographical influences which affect the significance of sundry of our most familiar designations. *Orthodoxy* does not differ more widely in its significance at London, Rome, and Mecca, than the Whiggery of English anti-conservatives does from

that of American conservative-whigs; though when one recalls the difference between the old Scottish *Wiggamor* of 1648, or even the Edinburgh *Whig* as he figures in Henry Cockburn's "Memorials of his Time," and what the Yankee would call the go-to-meeting respectability of the English *Whiggery* that makes its appearance under the *buff and blue* of the Edinburgh of January, 1858: it requires no great vaticination to predict such a transmutation of the English Whig into practical conservatism, as has come over the Republican Whig of the New World, since those times in the American Colonies when all were whigs who were revolutionary ante-royalists.

English and American politics, however, lie out of our way; but not so the principles of literary piracy involved in this adventure, and in the whole system of American-English reprints of which it is a sample. An English Macaulay, or a Thackeray, a Carlyle, a Tennyson, or an Elizabeth Browning, expend the toil of months and years over the midnight lamp, and adorn the fruits of their labor with all the priceless fire of genius, and the Anglo-Saxon of America unblushingly pilfers the product hot from the press, and appropriates it to himself in happy accordance with

> The good old rule, the simple plan,
> That they should take who have the power,
> And he should keep who can.

The American Nation is not incapable of liberal and generous acts. Does it never occur to any of the thousands who revel in the enjoyment of a Dickens', or Thackeray's, or Browning's pages, that therein lies the very source of their subsistence; that the earlier literary productions of some of these very authors have been produced with as sore travail as that which wrung the manly heart of young Samuel Johnson, when,—as Macaulay says, in extenuation of of the rougher asperities of his later years,—"he had been long tried by the bitterest calamities, by the want of meat, of fire, and of clothes, by the importunities of creditors, by the insolence of booksellers, by that bread which is the bitterest of all food, by those stairs which are the most toilsome of all paths, by that deferred hope which makes the heart sick." How knows, or cares, the American reader whether the living English poetess may not be stimulated to the production of her inspired song, even as Felicia Hemans was, that thereby she might win her bread and educate her sons. Nay, how knows he but that the poet's song is even now as vainly sung as that of "the marvellous boy" who perished, starving, while bequeathing his strange immortal lays to other times. Such things did not all come to an end with the eighteenth century. The

life of the literary man, dependent on his pen, is still as hard a one to many a gifted aspirant for fame as ever it was. Borrow, in more than one of his autobiographic passages, hints not obscurely at his early struggles. One of the most popular works of another living author, named above, is believed to derive some of the pungent force of its sardonic humor from having been written on a sick-bed for bread. What a priceless boon to these, at such a time, would have been even the few cents per copy, which the niggard policy of American Statesmanship witholds, as an acknowledgment of the author possessing some fractional right to the productions of his genius. With what a just pride might the American lay claim to a common blood, and common tongue, and a common freedom, with England's ennobled historian, if when he is laid in his honored grave, the American reader of Macaulay could tell his sons, with pardonable boast, that the literary British peer did not contribute, unrequited, to his intellectual culture and enjoyment. But till such scant and tardy justice is done the English author, let no American critic presume to discuss, with cheap liberality, the stinted honors which British Statesmanship awards to literature and science. Let no windy rhetorician dare to allude to Milton's ill-requited "Paradise Lost," to Dryden's unwritten "Arthur," or to Scotland's Burns, doomed, for its paltry pittance, to exchange his pen for the guager's rod that kept his children from want.

There is a grim humor in the coolness with which the American publishers quote a Texas able editor's comments on the cost of the English Review articles as enhancing the marketable value of the transatlantic theft. "These publications," says the candid editor of the *Gonzales Inquirer*, "afford the cheapest and best reading that can be procured in the English language;" and then he proceeds to furnish to his readers the following apt and forcible comments on cheap literature so acquired, aparently without the remotest idea that any one could dream of asking an equivalent for the appropriation of literary productions the value of which he so frankly owns:

"It may seem strange, though it is true notwithstanding, that the articles which appear in them cost the concern by which they are originally published, about twenty-five dollars per page. The four Reviews for the year contain over 2,500 pages, and Blackwood alone, more than half that number, making in all about four thousand pages, the aggregate of which amounts to near one hundred thousand dollars. So wonderful is the operation of the press, and its advantages so great, that all this accumulated mass of learning can now be afforded to any one situated even in this remote region of Texas for an amount but little more than we pay for a hat, or pair of boots, and much less than the price of a 'green tissue' for our daughter, or a chip bonnet for our better half."

As if still further bent on committing the whole American nation to this wholesale act of literary piracy, our New York publishers print a column of "commendatory notices of distinguished individuals," relative to the American reprints of the Edinburgh and London Quarterlies, commenced so long ago as 1812. *Judge Story* considers commendation almost useless.

Richard Rush, "for one, most heartily wishes them a wide circulation in this country. They cannot fail to help the cause of literature and genius." *Dr. David Hosack* is certain "they have already done much, and are calculated to improve still further the literary taste of our country." *De Witt Clinton* ventures to affirm that "the merits of these Reviews are in his opinion pre-eminently great as literary works, and the American publishers are entitled to public patronage." *Dr. Eliphalet Nott* considers "Whatever diversity of opinion may be entertained as to their distinctive merits, the information concentrated and the talent evolved in each is such as to render their possession to the American scholar and statesman an object of the first importance;" and the *Hon. C. A. Rodney*, *U. S. Senator from Delaware*, remarks of the Edinburgh Review, "taking it altogether it embraces within its grasp every art and science. It strews with flowers the most intricate and thorny paths of learning, and renders the most abstruse subjects familiar to common minds. In it the scholar, philosopher, and statesman may all find lessons of instruction, and neither of them should be without a copy. To the professional man and to those in the common walks of life it affords a fund of rational entertainment and valuable information. It is the key that unlocks the vast and various stores of literary and scientific treasure *which its writers have amassed by toiling in the inexhaustible mines of knowledge.*"

Most true is it, honorable and august senator of the great American nation, these stores of literary and scientific treasure, which you are thus appropriating as your own, have been amassed by the hard toil of writers, whose unremunerated labors go to enrich your wealthy republic, heedless though the toiler starve. "Behold, the hire of the labourer, which is of you kept back by fraud, crieth." But, "No!" elagantly and logically responds all America, through her able editor: "the articles which appear in these Reviews cost the concern by which they are originally published about twenty-five dollars per page; *ergo*, being already so well paid for, we may surely appropriate them to ourselves, in all conscience, at the price of a pair of boots!" And "No!" also indignantly responds the virtuous publisher, who after carrying on this unblushing robbery for years, under the high national sanction of America's copyright buccaneering system, now plumes himself, and congratulates his subscribers on the fact that he has at length brought the owners to his own terms, and has effected an arrangement for the receipt of *advanced sheets* from the British publishers, so that these reprints can be put into the hands of the Ameri-

can readers "at the price of a pair of boots;" while he is begged to N. B. *that the price in Great Britain, of the same five Periodicals, is $31 per annum!*

That the cost of the Reviews and other high class British periodicals, to their publishers, is great, is most true; and that much of this arises from the liberal scale of remuneration by which the services of the best authors is secured, is also perfectly correct. Review and other periodical literature is the staff of life to the literary man, especially in the earlier stages of his precarious career. By means of well-paid London Quarterly articles Southey secured the literary leisure for his Portugese History, and other laborious unremunerative labours. By his contributions to the pages of the Edinburgh and Westminster Reviews, and to Fraser's Magazine, Carlyle has been enabled to add his "Cromwell" and his "French Revolution" to the permanent stock of British Literature; and it is from among the host of "Magazine Writers," that the veterans of English literature step forth into the great arena of literary toil and triumph, producing the works which posterity will not willingly let die. It is because in the majority of cases the author must be well content to take out his reward for the great work of a life time, in fame, realized or anticipated, that the liberal remuneration he receives for the ephemeral productions of his pen, and the large prices he can command for the brief, though carefully elaborated and condensed Review Article, become of so much importance. They are designated by him, in homely metaphor, his *pot-boilers*. They keep the wolf from the door, while the busy brain and pen are weaving immortal lays, or dallying lovingly amid the intricacies of divine philosophy, or eliminating the national epos from the confused and contradictory rubbish-heaps of time. Thus was it with "Aurora Leigh," as we learn from her autobiographic confessions:

> "I had to live, that therefore I might work,
> And, being but poor, I was constrained, for life,
> To work with one hand for the booksellers,
> While working with the other for myself
> And Art. You swim with feet as well as hands,
> Or make small way. I apprehended this,—
> In England, no one lives by verse, that lives;
> And, apprehending, I resolved by prose
> To make a space to sphere my living verse.
> I wrote for cyclopædias, magazines,
> And weekly papers, holding up my name
> To keep it from the mud. I learnt the use
> Of the editorial "We" in a review,

As courtly ladies the fine tricks of trains,
And swept it grandly through the open doors
As if one could not pass through doors at all
Save so encumbered. I wrote tales beside,
To suit light readers. But . . . . what you do
For bread, will taste of common grain, not grapes,
Although you have a vineyard in Champagne."

And if it be so with the poet, it is even more so with those who instruct us in the lighter pages of Fiction. Sir Walter Scott contributed many a vigorous article to the "Quarterly" mainly because of its liberal exchequer; and it may perhaps be doubted if we should ever have had a "Nicholas Nickleby," or a "Vanity Fair," had not Dickens and Thackeray been first tempted to join these guerilla ranks of the light skirmishers of literature for a share of the pay.

"We ourselves," writes a Scottish member of the corps, "receive from Chamber's Journal twenty-one shillings per page, and for the continuous tales in the serial, a guinea and a-half per page is paid. In a page of Chambers there are about 1370 words—in a page of the Leisure Hour there are usually 1120 words, and for that number the Religious Tract Society pays fifteen shillings. Eliza Cook used to pay us a guinea for a page containing about 1250 words, and Charles Dickens still pays that sum for a page including only 1050 words. For the much smaller pages of Tait's, Sharpe's, Bentley's, and the New Monthly, half-a-guinea each is paid, while for pages of about the same size, Blackwood and the Dublin University pay double that price. For reviews, the Athenæum pays half-a-guinea, and the Critic and Literary Gazette, seven shillings per column, while the Quarterlies pay their contributors at rates varying from eight to sixteen guineas per sheet of sixteen pages." And this writer is no selected exceptional case, such as we could refer to, but one receiving the ordinary rate of pay.

By means of this liberal and widely recognised tariff, literature has become a regular profession in England, into which many of the ablest of those who were destined for the church and the law, for medicine and the arts, and even for commerce and trade, are drafted off from time to time, until the periodical press has become a power of recognised weight and commanding influence in the British Empire. But with all the improvements in the fare of the literary adventurer since the days when Collins and Goldsmith, and Fielding, and Thomson, could each diversify, from personal experience, the incidents of arrest for debt, we can point to few instances of fortunes won by literature. The successor of Samuel Johnson no longer devours a hungry meal behind the screen at St. John's Gate, which served to hide his ragged attire; but the literary guild might still accept of the motto suggested by the witty chaplain of the young Edinburgh reviewers in their elevated seclusion among the eighth and ninth flats of Buccleugh street,

'Tenui musam meditamur avena:—We cultivate literature on a little oatmeal,"—a motto which it will be remembered was exchanged for a sententious scrap of philosophy from Publius Syrus, because the former was found a little too near the literal truth to be quite agreeable to those literary adventurers.

The reasoning of many a young and inexperienced literary adventurer, when first launched fairly into the middle-stream,—a recognised contributor to sundry of the standard Weeklies, Monthlies, and Quarterlies,—has been very much in this Alnascar fashion: "I get eight guineas per sheet for an article, such as that which I have just finished within the week. There are fifty-two weeks in the year, and authors who receive, not eight but sixteen, and even thirty guineas per sheet; what may not a young hopeful like me anticipate." And it is well accordingly, if our hopeful young visionary do not marry on the faith of it, and start a domestic establishment in modest emulation of Abbotsford or Strawberry Hill. But long before he gains admittance to the rank of veterans—if ever he get there—he has learned that head-work cannot be carried on like hand-work, systematically on day-wages; that there are not fifty-two, nor even twenty-six weeks in his year; and that in truth sixteen guineas per sheet for the concentrated essence of the study and thought of years, is after all no such high-road to fortune as he had fancied when he reaped the first harvest from his fallow brain.

If therefore it be true that the wretched traditional race of Grub street literary hacks be no more; and Pope's satire would no longer furnish a sufficient directory for finding Curll's authors—"the historian at the tallow-chandler's under the blind arch in Petty France, the two translators in bed together, or the poet in the cock-loft in Budge row, whose landlady keeps the ladder;"—and though a pre-Raphaelite Hogarth of the present day would no longer find his Tragi-Comedy in the pale young wife of the sans-cullotte author, dunned, in his garret, for the milk-maid's tally-stick, while she plies her needle to repair the threadbare but indispensable nether garment,—though all this, we say, be no more, nevertheless, no one possessed of the slightest knowledge of the subject will say that the English literary man of the nineteenth century is overpaid. Nor would it have been an act of supererogation for the appreciative American editor, who "most earnestly advises all parochial literary clubs and Lyceums to take these valuable publications, as they cannot realise anything like the same amount of literary and intellectual wealth for a similar outlay;" if he had added,—and when you have realized the amount of literary and

intellectual wealth thus appropriated, consider, good American reader what the judgment on you, and your copyright law will be, in the great final court of appeal of posterity, when it shall appear that in so doing you were withholding their just meed, and robbing of their hardly earned wages, the English Chattertons and Goldsmiths, the Fieldings and Johnsons, of this later century. Consider, most appreciative American reader, what a Carlyle, a Kingsley, an Isaac Taylor, a Thackeray, or others of those who, in pursuit of literary fame,

"Scorn delights, and live laborious days;"

might have contributed to you in return for the small percentage you would never miss. Consider that, guaranteed in such, Hugh Miller, —relieved of the drudgery of editorial task-work,—might have lived and wrought, might have taught and delighted us and you still. If that old England of ours be in reality a sort of guano-island from which you may thus calculate on importing such fertilizing cargoes for your own intellectual culture, would it not become your practical sagacity to get the most and the best out of it, even at the cost of a very little temporary self-denial. What Hugh Miller might and could have done, would have rendered very insignificant all he has done; and would have well repayed you for any investment. Poor old Dr. Dick, the author of "The Christian Philosopher," and other works more highly appreciated in the States than at home,—at the very time that his writings were selling to admiring American readers for behoof of their dishonest appropriators,—had to go well nigh a begging, at the age of eighty-three, before the meager pension of £50 was doled out to him from the British Privy Purse. Happily such cases are not the rule in the experience of our modern literary men; but authors enough might be named, whose works have been selling by thousands for behoof of their American appropriators, while they have been compelled to uncongenial toil to win for themselves the income needful for their most moderate requirements. In his column of "gossip" the enlightened citizen of the American "Modern Athens," might glance over the notices of contributions, literary and dramatic, generously made by a Bulwer, or Dickens, or Martin: now on behalf of a General Literary Fund, and again for the family of a Douglas Jerrold or other deceased author, whose works the lettered citizen had meanwhile seen surreptitiously appropriated for his own behoof; and the titles of which he could read off in whole columns in the advertising sheets of Boston's most reputable publishers, to be had at the low charge of 75 cents per volume:

"We, the liberal and enterprising publishers of the Great American "Nation, being able to offer such to our enlightened citizens as one "of the fruits of our glorious Revolution, whereby, after all its other "triumphs, we have the delectable privilege of stealing the brains "and picking the pockets of starving authors. N.B.—The Felicia "Hemans's, Charlotte Bronte's, Margaret Oliphant's, Mary Somer-"ville's, and other popular authoresses, being Britishers and aliens, "we have the pleasure of informing our customers that the privileges "and courtesies of womanhood do not apply to them on our side of "the Atlantic; and so we have the gratification of offering you the "fruits of all their toil, also, without your having to pay a single "cent for anybody's labour or profit but our own. It beats the De-"claration of Rights hollow; for if you do appropriate *the works* of "one of your colored authors of plantation cotton and sugar cane, "you cannot let him starve, as may be done with those alien geniuses "of ours!"

Yet let us not blame too severely the American Publisher, for what is the sin of the nation. Some of these publishers have given creditable evidence of their desire to acquire by honorable means their right to the works of British Authors; and among such none have been more liberal than Messrs. Ticknor & Fields, of Boston. Robert Browning thus writes to them, from Paris, in 1855:

"I take advantage of the opportunity of the publication in the United States of my 'Men and Women,' for printing which you have liberally remunerated me, to express my earnest desire that the power of publishing in America this and every subsequent work of mine may rest exclusively with your House."

Again the authoress of "Aurora Leigh" writes from London, at the date of its completion:

"Having received what I consider to be sufficient remuneration from Mr. Francis, of New York, *it is my earnest desire that his right in this and future editions of the same, may not be interfered with.*"

Again, Mr, De Quincey thus writes to Messrs. Ticknor, Reed, and Fields, transferring to them certain new papers for their collected edition of his writings:

"These I am anxious to put into the hands of your house, and, so far as regards the U. S. of *your* house exclusively; not with any view to further emolument, but as an acknowledgement of the services which you have already rendered me, ... in having made me a participator in the pecuniary profits of the American edition, without solicitation or the shadow of any expectation on my part, without any legal claim that I could plead, or equitable warrant in established usage. . . . . . They are now tendered to the appropriation of your

individual house, *according to the amplest extent of any power to make such a transfer that I may be found to possess by law or custom in America.*"

These are creditable testimonials to the publishers who print them, but what do they amount to? So far as the American nation is concerned in the matter they make things considerably worse. Such letters indeed might be usefully copied in other matters besides book-traffic. Messrs. A—. B—., a Greek house in the Levant, having sold a cargo of Odessa wheat to a Liverpool skipper, could not do better than supply him with a similar document, to produce on the coast of Barbary, in case any colored gentlemen of an enterprising turn, in that free and enlightened corner of the globe, should take a fancy to visit him on the voyage home. The attention it would be likely to receive would depend, we imagine, fully as much in the one case as in the other, on the probable risks and profits likely to be the result of either appropriation.

One example in proof will suffice. A New York firm, by no means the foremost among American publishers to recognise any claims which British authors might fancy they had on those who appropriated their works for the purposes of trade, have found, or fancied, it for their interest to give Mr. Thackeray two thousand dollars for early proof sheets of his "Virginians;" a similar transaction with Mr. Dickens for his "Little Dorrit" having proved a profitable speculation. But another publisher, as they indignantly complain, has begun to reprint these very sheets of "The Virginians" in the columns of a New York daily paper; an act which Messrs. Harper protest must put an end to all monetary transactions between British authors and the American appropriators of their works. In the light of this, the most recent illustration of Anglo-American copy-rights, we may estimate the monetary value of Elizabeth Browning's "earnest desire" that the chivalry of America will respect her rights of authorship; or De Quincey's grateful transfer to the liberal Boston House, of all the rights in the creations of his own hand and brain which *he may be found to possess, by law or custom, in America!*

And what, meanwhile, does the American author say to all this? If no chivalrous sympathy with his order, awaken him to a generous fellow-feeling for his English brother, does it not occur to him to ask what is its effect, for example, on his own solitary "North American Review." Does that native periodical perform the important functions to the literary men of the Union, or even of Boston, which have been done to those of Edinburgh and London by their Magazines and Reviews? Is it no direct and palpable, though inestima-

ble loss to the American literary men, and consequently to American literature, that Harper's New York Magazine has gone on for years appropriating the contributions made to English Magazines, instead of honestly paying its own writers for original material, such as a citizen of the Great Republic could read without blushing, in the presence of an Englishman. We dare say Mr. Bentley of London is not much the worse for it, that the great New York house carries its wholesale pilfering so far that the very wood-cut device on "Harper's" wrapper, instead of being commissioned and paid for among the artists of New York, is stolen from the cover of "Bentley's Miscellany." Poor Raphael Michael Angelo Daub, however, that ill-faring genius in his Broadway attic, might have dined sumptuously on it for a week, and his far distant brother in smoky old London never a bit the poorer for it. Let the English *Littérateur* derive from the fact such pleasure as he can, that if the 'cute Yankee does rob him wholesale, it is in order to furnish the means to starve his own native-born literary men, and drive them fairly out of the field. Boston, however, if report speaks true, boasts of a literary aristocracy, with purses well balancing their golden pens, to whom the maintenance of the Union's Literary repute is a thing altogether apart from base considerations of pelf. The names of Prescott, and Longfellow, and Agassiz, and others of her gifted sons, are too well known and appreciated not to make us rejoicingly credulous in relation to all that pertains to their well-being; but some such morrocochaired and easy-slippered reviewer it must have been who garnished his "North American" article with the famous verses of the old Metaphysician and Bishop of Cloyne:

The muse, disgusted at an age and clime,
  Barren of every glorious theme,
In distant lands now waits a better time,
  Producing subjects worthy fame.

There shall be sung another golden age,
  The rise of empire and of arts,
The good and great inspiring epic rage,
  The wisest heads and noblest hearts.

Not such as Europe breeds in her decay;
  Such as she bred when fresh and young,
When heavenly flame did animate her clay,
  By future poets shall be sung.

Westward the course of empire takes its way;
The four first acts already past,
A fifth shall close the drama with the day;
Time's noblest offspring is the last.

This is a favorite quotation with the American orator, and n
wonder it should be. But what dawn does the literary man see a
yet, in promise of this "Golden Age," for the singing of grea
inspiring epics by America's future poets? "Why music with he
silver sound?" demands Peter of James Soundpost, in "*Romeo an
Juliet*," who knows not what to say in reply. "O, I cry you mercy
retorts the accute Peter: "You are the singer, I will say for you-
It is—music with her silver sound, because such fellows as you ha
seldom gold for sounding!"

To the English literary man, it is unquestionably a grievous wron
that, while the Manchester and Glasgow manufacturer finds all pr
tection for his "soft goods," in Boston or New York, and the har
ware of the Sheffield worker may seek its best market in the Unio
as elsewhere; the manufactures of the historian, the poet, the essa
ist, and the novelist, are contraband, and may be appropriated f
his own behoof by any pilferer who finds or fancies it his interest t
steal. We cannot doubt that there are many—though still a mino
ity—among the intelligent citizens of the States, to whom Thackera
and Tennyson, Macaulay and Grote, Carlyle, Ruskin, McCosh, an
other favorite British authors, would not be less, but more welcom
if it were believed that America's appreciation of them was not u
productive of more substantial returns than such barren laurels. I
the case of the Review reprints, however, the British essayist is n
without some return. If his literary work is appropriated witho
leave asked or remuneration offered, it is something for him to kno
that the *Edinburgh* and the *London*, the *North British* and the *Wes
minster* Quarterlies, have hundreds of readers in the United State
for one that their native-born Review can command. The pow
thus wielded within a foreign state is beginning at length to b
appreciated. Already we have seen examples of the Americ
statesman sending home his carefully elaborated article, that by i
reappearance in the surreptitious American reprint of the Briti
Review, it may produce an effect which he would in vain look f
from any article issued under the sanction of a native periodic
The English writer learns also to feel that he is writing for the pe
usal of the whole Anglo-Saxon race. American as well as Coloni
affairs begin to command a more enlarged attention; and not th

least satisfactory phaze, in this good educed out of evil, is an improved tone in treating of American affairs. In dealing even with the great social evil, it is no longer deemed sufficient merely to give utterance to an inarticulate howl over the wrongs of the slave. The matter-of-fact political economist, and the enthusiastic philanthrophist, are both learning to apply their own home experience and so to take a more comprehensive view of the difficulties with which the American has to deal: recalling to remembrance the slow process by which England has delivered herself from her own social wrongs,—fighting the battle for generations before she could remove the disabilities of the Protestant noncomformist; restore her representative system to some conformity with the theory which had so long been her boast; or even rid herself of the protective system which checked alike the development of her commerce and agriculture. The necessity for accurate and minute knowledge on America is creating that interest in her proceedings, out of which kindlier sympathies will grow. A spirit at once more generous and more just rules the pen of the English writer who ventures to touch on American affairs, though still ignorance will at times betray its presumption, and obtrude its folly. In this direction, at all events, the good influence is at work, and it will be no slight alleviation of all the wrongs of the English author, if the final result be the binding together more closely, by an intelligent appreciation of each other, the common descendants of what Milton proudly called "God's free Englishmen."

And how stands it with us in Canada, meanwhile? We are, of course, virtuously indignant at the very name of slavery, repudiation, fillibustering, and literary piracy; and are quite ready to cast the first stone at our offending neighbor, caught in the very act: we being so entirely without sin ourselves! That American reprints are sold as freely in any of the British Provinces as in the States, has long been notorious to all men. This had existed as an illegal usage which it was convenient for the Colonial conscience to overlook, till the cry of the British author for a further instalment of justice at home, directed attention to this additional grievance, and at length an Act of the Provincial legislature legalized the admission of American reprints of British authors into Canada, on their paying a duty of 10 per cent., which per centage was to be handed over as a sort of black-mail discount for behoof of the despoiled author. Such accordingly has been done on two separate occasions. We have been at some trouble to ascertain the facts, and learn that for the years 1854-55, a first instalment of £252 11s. 3d. was paid over

by the accredited provincial authorities to the *British Custom House* being the duties collected in the interval from the passing of the Provincial Act, on American reprints of British authors, introduced into the Province. In 1856, a further sum of £313 6s. 10d., was in like manner transferred to the supposed agent and receiver on behoof of the British author; and there now lies a further sum ready for disposal in like manner. But the awkward bit of the business is that the duties on imported reprints are not collected, so much on Macaulay, so much on Meg Dods, so much on Tennyson and Firmilian, on Thackeray and James, on Dr. Livingstone and the Hon Miss Murray, but all in a lump; so that, while we pay this composition to our self-constituted representative of the literary home creditor, and wash our hands clear of the whole business with al good conscience, one does not see how the poor literary gentleman in his Grub Street attic, is to be in any degree benefited by such vicarious transaction. Did any English author, we wonder, ever hear of this Canadian "conscience money"? Does it go to provide the Poet Laureat's annual butt of Canary, or is it engulphed in the mysterious disbursements of the Literary Fund?

Meanwhile we have recently had rather an unpleasant illustration of the one-sided operation of non-international copyright law. The well-known popularity of Mrs. Stowe's "Uncle Tom," naturally drew attention to her forth-coming "Dred," and no sooner did it make its appearance, than two enterprising Canadian publishers,—one in Montreal, and another in Toronto,—issued editions of it. Mrs. Stowe had, it seemed, published simultaneously in Britain and America, to secure a double copyright; but the Canadian publisher having copied the American edition, with its special preface, dreamt of no danger. In this, however, he was mistaken. The American authoress interfered, and through her British publisher, appealed to the law of England as applicable throughout the Empire. The claim, at the first blush, seemed a bit of American impudence, worthy of Barnum's effrontery. Calm consideration, however, showed that it involved a high principle, not to be decided by mere motives of personal interest; and, as was to be expected, justice prevailed. The Canadian publisher found himself compelled, however loth, not only to suppress his edition, but to pay £100 damages to avert further legal process. The case may seem a hard one, which thus allows the piratical publisher of the United States to steal, and even protects him in the sale of his stolen goods; and yet when the Canadian publisher makes reprisals on the American author, the law steps in to protect such alien rights.

Yet we cannot but rejoice that it was so decided. It was worthy of Britain, and honorable to the Province. Let us hope that such an example of the impartial and self-denying award of justice, in the face of such notorious wrongs as might well have tempted to an opposite course, will not be lost on our neighbors; and that they too may perceive that not only the honor, but even the true interests of a great nation may be ultimately promoted by a disinterested course of justice, rather than by a systematic procedure which must justify itself, according to any conceivable law of nations, by an appeal to precedents set by the Barbary Corsair, or the West Indian Buccaneer.

There is one lesson, however, which the above phaze of Canadian copyright might teach the British publisher. If the sale which a popular work can now command in Canada is so great that two different publishers could see their interests compatible with the issue of an edition of Mrs. Stowe's "Dred," why should not the British publisher forestal the American piratical reprinter, by means of cheap Colonial editions. If the American publisher can make a profit among us on the works of Layard, Tennyson, Hugh Miller, Thackeray, Livingstone, and other favorite authors, the British publisher may do the same, by the simultaneous issue of English and Colonial editions. Why should not Macaulay be read in every corner of the empire in an English edition; and Dickens' scenes of home-life come to us with the native imprint; and Tennyson open on us, in all his patriotic fervor of inspiration, on leaves that have been "composed" from his own MSS. and corrected by his own pen. If the English publisher will not so supply us, he cannot complain if we object to his playing the dog in the manger, and interfering with others who will. The New York reprints of the British Quarterlies bear on their wrappers the names of agents in Canada, New Brunswick, Nova Scotia, and Barbadoes; and we believe they now find their way to New Zealand, Australia, and the Cape. Certain it is that the American publisher, by escaping all payment to the author, is able to undersell the British publisher in every Colony of the empire. The British publisher must, therefore, so far learn to ignore the author, in calculating the cost of his work. The type is standing. Why not use it for the cheaper Colonial edition? The copyright has been acquired; wherefore not employ it as if it were the printed copy from which the American publisher takes his surreptitious reprint? Unquestionably for works of really popular interest, the sale throughout the British Colonies would prove abundantly remunerative; and even should the author enjoy no direct share of these profits, his interests are not so entirely dissociated from those of his

publisher that he need grudge him what would otherwise go to the foreigner, who may,—as he not unfrequently does,—take any liberty with the text that self-interest or caprice may dictate.

But we would rather hope to see this question settled on a wider basis, and embracing larger interests, wherein those of the author shall not be entirely forgotten. Nor is such an idea altogether Utopian. A recent notice of the New York *Daily Times* shows, at least, that the project of an international copyright between Great Britain and the United States, is not regarded as entirely hopeless. The following are the terms of a proposed arrangement, the authorship of which is ascribed to Mr. Goderich:

1. An author, being a citizen of Great Britain, shall have copyright in the United States for a period not exceeding fourteen years, on the following conditions:

2. He shall give due notice in the United States of his intention to secure his copyright in this country three months before the publication of his book, and this shall be issued in the United States within thirty days after its publication in Great Britain.

3. His work shall be published by an American citizen, who shall lodge a certificate in the office of the Clerk of the Court of the District where he resides, stating in whose behalf the copyright is taken, and this shall be printed on the back of the title page.

4. The work shall be printed on American paper, and the binding shall be wholly executed in the United States.

5. This privilege shall be extended only to books, and not to periodicals.

6. The arrangement thus made in behalf of the British authors in America to be extended to American authors in Great Britain, and upon similar conditions.

The terms, it will be seen, preclude periodicals from their operation, and would, therefore, leave unprotected that important and highly profitable feature of the *feuilleton:* the contribution of the novel, biography, or tale of travels, to the pages of a periodical, before its publication in a complete form. This, as it is one of the greatest sources of direct profit both to the British and American author, specially requires reconsideration. That the plan leaves the British Quarterlies entirely out of the pale of all legal protection, we do not overlook. We presume their publishers will at least retain the privilege of bargaining for the price of "first sheets," so long as they continue to be worth republication. That there is no doubt at present on this latter question of their being worth republishing may be seen by the following extract from Messrs. Scott & Co.'s last annual circular, borrowed from the *Chicago Tribune,* with its gossip about the editorial staff not altogether up to the latest date:

"Of *Blackwood* we hardly know what to say. Although it may be called the embodied genius of Toryism, yet its witching rhetoric, its captivating style, its profound disquisitions, its range of elegant fiction, its slashing yet brilliant criticisms, its poetry, biography, historical and fictitious narratives, so charm the sense, that criticism is disarmed, and we are lost in admiration. The circulation of *Blackwood* in England is said to be 40,000 copies. It is also widely circulated in this country, and is universally admired. The publisher recently informed us that 'Blackwood edits itself,' yet its list of contributors is well known, and embraces an amount of talent and genius which has rarely if ever been concentrated on a single periodical.

The present editor of the *Edinburgh* is Mr. REEVE; of the *North British*, Prof. FRASER [?]; of the *Westminster*, JOHN CHAPMAN (the American London bookseller) [?]; of the *Quarterly*, Rev. W. ELWYN. An able corps is attached to each Review, selected from the choicest talent of Great Britain.

Sustained, then, as these distinguished works are and ever have been, by the highest order of scholastic ability and political sagacity, we need not be surprised to find them occupying such a proud pre-eminence among the literary productions of the world, and the neglect of their high claims upon the consideration of all classes of the intelligent community, would necessarily argue a corresponding indifference to the great interests of the common weal.

Every intelligent reader should subscribe to these periodicals furnishing so much seasonable intellectual aliment, and which the enterprise of American publishers has placed within the reach of all."

Had it suited the publisher's purpose, we should have preferred an extract from a southern editorial notice, being curious about the reception of some of these quarterly visitors by over-sensitive southern gentlemen of a bilious or choleric turn. But we have not heard of Messrs. Russell & Jones of Charleston, or Mr. Bell of Alexandria, Va., or Mr. Morgan of New Orleans, who figure on the wrappers, being tarred and feathered for the sale of incendiary publications; so we presume it is all right, and perhaps, indeed, upon the whole, consoling to wounded southern feelings to think, while perusing these American reprints, that the meddlesome British scribe is never a picayune the better for all the copies that circulate from Maine to Florida.

D. W.

Descriptions of New Species of Palæozoic Fossils.—[Extracted from the Report of the Regents of the University, for 1856.]—By James Hall. Albany, 1857.

The two volumes already published, of the Palæontology of the State of New York, by Professor Hall, of Albany, comprise the fossils of the respective subdivisions of the Lower and Upper Silurian forma-

tions, from the Potsdam Sandstone to the Onondaga Group inclusive. In the publication now under notice—an octavo pamphlet of 150 pages with numerous wood-engravings—the author anticipates, in part, the volumes of the "Palæontology" that have yet to appear; being driven to this course by an act of scientific dishonesty, against which we cannot too loudly exclaim. It may not be generally known that the original intention with regard to the publication of the Palæontological results of the survey of New York, was to issue a single volume merely with wood-engravings of the more common or characteristic fossils. In furtherance of this view, a number of wood-cuts were prepared; but in consequence of a more extended plan of publication being afterwards adopted, and copper-plate engravings authorized for the illustration of the work, a few only of these wood-cuts were made use of. The blocks were subsequently obtained, under questionable authority, from the Curator of the State Cabinets of Natural History, in Albany; and many of the figures were published without the permission of their author. Fearing that the publication of other figures, illustrative of species yet undescribed, may follow, Professor Hall has issued the present volume, with a view to secure himself against being thus forestalled. The accompanying remarks, attached to the volume by way of preface, explain these facts more fully.

"During the progress of the Report upon the Fourth Geological District of the State, a considerable number of woodcuts were engraved for the illustration of the fossils of the Hamilton and Chemung groups which were intended for that volume. Before the volume was entirely out of the press, the preparation of the Palæontology of the State was placed under my direction. According to existing contracts with the State, the wood engraving was continued; and as the first intention was to complete the work on the palæontology in a single volume, drawings were made of the more common and conspicuous fossils of all the successive rocks, or of all such as I had the means of procuring.

"However, after ascertaining the great amount of material, and the necessary extent of the work, the plan of publication was changed, and several volumes were authorized; more extended collections were made, and the work prepared as it has already appeared in the published volumes, in the first of which some of these cuts were used.

"In the mean time the woodcuts of many unpublished species of fossils, together with others for generic and elementary illustration, intended for the Palæontology of the State, remained in the custody of the Curator of the State Cabinets of Natural History, until the autumn of 1854, when, under doubtful permission, these cuts were removed from the Geological Rooms, and some of them soon after appeared in a private publication. After much delay, the original woodcuts were restored to the custody of the proper officers, but not until after they had been *stereotyped;* and as the stereotypes remain in the possession of the party who first obtained the cuts from the Cabinet, it is in the power of that

party to publish the illustrations of many new species in advance of the issue of the State Work on Palæontology, and to the prejudice of the interests of the State therein. Under these circumstances, it is thought proper to give concise descriptions of these fossils, prior to their appearance in the regular volumes of the Palæontology."

During the early part of 1856, an attempt was made by certain interested parties to arrest, or at least impede, the issue of the volumes of the Palæontology, still under preparation. A so-called "Report," of a most glaringly one-sided character, was got up by a "select committee" of the House of Assembly, opposing the work on the score of expense, and condemning the number of the illustrations as a piece of wanton extravagance. Against this, we ventured at the time to protest;* and we were happy to find that the Report met with no favor from the members of the Assembly generally, and was not acted upon in any way. We mention this more especially, because, if we mistake not, it was argued in this Report, that the wood-cuts already alluded to, were amply sufficient for all practical or scientific purposes —a fallacy brought out very prominently by the engravings in the present volume. Some of these are tolerably well executed, but the majority of them are altogether insufficient for the really useful illustration of the more minute and important structural details. It is quite evident that Professor Hall acted for the best interests of science, when he discarded the wood-cuts in question for the beautifully executed engravings of the Palæontology proper.

In the present publication, the Brachiopoda of the Lower Helderberg, Oriskany Sandstone, Upper Helderberg, Hamilton, and Chemung groups, respectively, are alone considered. Nearly all the species described are new: and many, the Producti more particularly (from their comparative rarity as Devonian forms), are especially interesting. A number of species of this type, more than doubling those hitherto recognized in the Devonian rocks of Europe, are here enumerated from the Hamilton and Chemung groups, the lowest in which they occur. Professor Hall has also revived, or re-constituted, several genera, more or less abandoned as such, by European Palæontologists. There will probably, however, be some difference of opinion as to the expediency of these revivals. We doubt much, for example—with all deference to the justly-distinguished author—if the revival of the Meganteris of Suess will be adopted by palæontologists generally. So far as we can

* Canadian Journal, New Series, Vol. I. p. 386.

judge from Prof. Hall's figures and descriptions, for no definition of the genus is given, it appears to us that the species here included, might be legitimately arranged under McCoy's Athyris (Spirigera, d'Orb.); or, in part, under Terebratula, in which genus, as the type of a group of Palæozoic Terebratulæ without deltidium, we would place the Seminula of McCoy. The texture of the shell in Hall's Meganteris is not stated. In the work now under notice, little more than a brief enumeration of the proposed new species could be expected: the author's object being simply, as before observed, to ensure a priority of publication. It will add however, very much to the utility of the volumes of the Palæontology about to appear, if a definition of each genus be given, and a distribution of the genera into families be at the same time adopted. Comparisons will in this manner be much facilitated, and an air of greater completeness imparted to the work. These definitions are not only essential in the case of new genera, but they are equally necessary with regard to genera already established; because in adopting one another's genera, palæontologists are rarely agreed as to the precise limitation of these. With the progress of discovery, indeed, the necessity of modifying earlier definitions will, from time to time, unavoidably arise; especially as it is above all things desirable to keep down the array of new names as much as possible, and to guard strictly against the adoption as generic, of characters of a specific value only. In Palæontology—and in the Class Brachiopoda more particularly, where the most essential characters, for instance, are so rarely to be observed—the greatest caution, for the sake of those who come after us, is in this respect, necessary. With regard to specific forms also, we trust the day is not far distant, when palæontologists will be willing to admit that a merely relative difference—a difference, for example, that cannot be properly appreciated without the aid of figures—is not a sufficient warranty for the foundation of a second species. These remarks, however, are not to be applied to the author of the work of which we now take leave. Our readers, if at all acquainted with the subject, will know well, that if Professor Hall, in accordance with a system too much in vogue, had chosen to turn "species-maker," he might have given us twenty new species, where he has given us one. For the exercise of this discriminating judgment, palæontologists generally owe him their best thanks.

E. J. C.

SCIENTIFIC AND LITERARY NOTES.

GEOLOGY AND MINERALOGY.

POST-TERTIARIES, ETC., OF MONTREAL.

Professor Dawson, Principal of McGill College, has favored us with a copy of a very interesting paper on the Newer and Post Pliocene beds of Montreal and its vicinity, lately read by him before the Natural History Society of that city. The deposits in question, commencing with the lowest, are characterised as follows:— 1. The ordinary Boulder Clay; 2. Leda Clay, an unctuous calcareous clay containing a few marine fossils, and reaching in places a thickness of twenty feet; and, 3. Saxicava Sand, a fine-grained sand, in places underlaid or replaced by stratified gravel, and containing marine fossils in the lower part. Boulders occur in the two upper deposits as well as in the Boulder Clay, properly so called. In places, the Leda Clay has been apparently carried off by denudation, the sands and gravel resting directly on the Boulder Clay, or on the underlying Limestone, as at the Mile End quarries, &c. In a deposit of sand and sandy clay occupying a depression between these quarries and a ridge formed by a thick trap-dyke near the house of James Logan, Esq., Professor Dawson discovered (with many already recognised forms) no fewer than eleven distinct species of gasteropods and lamellibranchiate molluscs, besides a serpula, a cytheridea, several foraminifera and the spicula of a sponge—not hitherto described amongst our post-tertiary fossils. In addition to these, several new species, obtained principally by the Geological Survey, the author, and the Rev. Mr. Kemp, from the neighborhood of Montreal, Beauport, and elsewhere, are described for the first time by Professor Dawson in his paper; thus bringing up the list of new forms due to his determinations, to about thirty. As the author observes, these marine shell-bearing deposits although occurring in various parts of Lower Canada, have not been met with further west than Kingston. During the last two summers we have searched very diligently for their presence amongst our drift and post-tertiary formations, but without success. Our limited space prevents us from entering into a fuller analysis of Professor Dawson's valuable communication, but the geological reader will find the entire paper in the last number of the Canadian Naturalist.

PLACODUS.

Professor Owen, in a letter addressed to the editors of the "Annals of Natural History," and published in the November number of last year, has expressed his conviction that the Placodus of Agassiz—a supposed fossil fish of the Triassic epoch—belongs really to the class of Reptiles. This view has been adopted from an examination of specimens of P. Andreani, sent by the well-known mineral dealer, M. Krantz of Bonn, to the British Museum. [The species of Placodus hitherto enumerated, comprise: P. Andreani, Munster; P. rostratus, Munster; P. gigas, Agassiz; P. Munster, Ag.; and P. impressus, Ag. The last is from the new red sandstone of Deux Ponts; the other four, from the Muschelkalk of Bamberg in Bavaria. Teeth, and portions of the cranium are only known.] Professor Owen promises further details.

UNITY OF PLEURACANTHUS, DIPLODUS, AND XENACANTHUS.

Sir Philip Egerton (Ann. Nat. His. No. 119) has ascertained the mutual indentity of the carboniferous fish-types, Pleuracanthus* and Diplodus of Agassiz; and he has also shewn, as previously suspected by Beyrich, that the Xenacanthus Decheni of the Permian beds of Bohemia, &c., is generically identical with Diplodus. Orthacanthus, Ag., is likewise a closely related form, if not really, as viewed by Goldfuss, the same type. Considering, says the author, publication as the test of priority, the genera Diplodus (1843) and Xenacanthus (1847) must merge into Pleuracanthus, which was put forth in the "Poissons Fossiles" in 1837.

SILURIAN STAR-FISHES.

Mr. Salter (Ann. Nat. His. Nov. 1857) has described a number of new star-fishes —Asteriadæ and Ophiuridæ — chiefly from a recently discovered locality at Leintwardine in Shropshire, where they occur in the flag-stones of the Lower Ludlow Rock. Species of our New World genus, Palæaster; Hall — a type ranging in England from the Lower Silurian into the base of the Carboniferous series—are also described in the same paper. The genus is defined by Mr. Salter as follows:—*Palæaster*, J. Hall. Arms thick, convex, short or moderately elongate, and formed of many rows of small spinous ossicles above (with a madreporic tubercle near the angle of one pair of arms): ambulacra deep, with *transverse* ossicles, and a single row of large adambulacral plates. Disk plates between the arms, none.

CIRCULAR POLARIZATION IN CINNABAR.

M. Descloizeaux (Annales de Chimie et de Physique, Nov. 1857) has made the interesting discovery, that Cinnabar, like Quartz, possesses not only a *positive* axis of double refraction—contrary to the statement of Sir David Brewster—but that it also exhibits circular polarization. As in the case of Quartz also, the latter phenomenon in different specimens is left-handed or right-handed respectively; whilst in plates cut from twin or interpenetrated crystals, two kinds are simultaneously present. These facts are the more curious, as no traces of hemihedral modifications have yet been detected in Cinnabar.

BRACHIOPODA.

The synoptical view, given below, of the classification groups and principal genera of the Brachiopods, may prove useful to some of our readers. It may be mentioned briefly, that the Brachiopods differ essentially from the Lamellibranchiata, or ordinary acephalous molluscs, by their organs of respiration. The lamellibranchiate mollusc in its adult condition possesses, as breathing organs, two pairs of bi-laminated gills or branchiæ; whilst in the brachiopod, respiration is effected by the veined and ciliated lobes of the mantle. The coiled and ciliated arms of the Brachiopoda (from which the order derives its name) appear to be destitute of the large veins of the mantle-lobes, and hence to take no direct part in the respiratory process. They are supported in many genera by a calcareous loop or special framework attached to the inside of the smaller or entering valve; but in many

* A species of Pleuracanthus (P. tuberculatus) has also been cited by Eichwald from the Devonian rocks of Russia; and another Devonian form (P. laciniatus) by F. Roemer, from the Hartz. These species, however, like many others based on fragmentary evidence, should probably be regarded at present as merely nominal.—E. J. C.

genera this framework is wanting. The coiling of the arms—the mode of which varies in the different families—gives a larger amount of surface, than would otherwise result, for the development of the cilia (or ciliated cirri) with which they are clothed. In the living species unprovided with internal shelly processes, they are more or less extensible, and this was probably the case also with regard to the extinct forms similarly constituted. In the species, however, in which these shelly processes were present, the arms were undoubtedly incapable of protrusion beyond the shell. Besides which, the mode of articulation of the valves, in the generality of cases, is such as to prevent the opening of the shell to any extent. The shell itself—equilateral in form, but with unequal valves—is traversed in most genera by minute pores or tubular prolongations probably connected with respiratory functions, although in the family of the Rhynconellidæ, as well as in certain spirifers, &c., these pores are not observable. The shell is then said to be impunctate. The fossil brachiopods were attached to sub-marine objects by a predicel or byssus passing through an opening in one of the valves—or, in some genera, by the direct surface of the larger valve; otherwise they existed as free shells. Whether fixed or free, however, the brachiopods in the adult condition possess no powers of locomotion.

The Brachiopoda admit of being grouped in two sub-orders: 1. Brachiopoda proper; and, 2. Rudistes. There is at present a strong disposition to class the latter with the Lamellibranchiata, placing them near the Chamidæ: a view supported especially by Deshayes, Davidson, Bayle, and Woodward, in opposition to the opinion of Goldfuss, d'Orbigny, Pictet, McCoy, Philippi, and other observers. The question is still an open one—perhaps eventually to be settled by raising the Rudistes to the rank of a distinct order intermediate between the true brachiopoda and the ordinary acephala. The perforated shell-structure, (although not in all cases detected), the conformation of the hinge, and the mode of growth of the shell, are among the more salient characters which separate the Rudistes from these latter. Some very able papers, by Bayle and others, taking the lamellibranchiate view, may be seen in the thirteenth and fourteenth volumes of the Bulletin de la Société Géologique de France. In the annexed distribution the Brachiopoda proper are alone considered.

TABLE 1.—*Families of the Brachiopoda.*

No true articulation by hinge-teeth.	Shell: thin, horny,	Neither valve perforated	Lingulidæ.
		Slit or Foramen in one valve	Discinidæ.
	Shell: thick, calcareous,	Area wanting, or obscure	Craniadæ.
		Area largely developed	Calceolidæ.
Valves articulated by hinge-teeth.*	No internal shelly process,	Hinge-line straight	Orthisidæ.
	Internal shelly processes,	Shell containing calcareous spiral processes pointing outwards	Spiriferidæ.
		Slight internal process; hinge-line arched; no area. Arms in living type, pointing downwards and inwards	Rhynconellidæ.
		Internal shelly loop; shell punctate, thin	Terebratulidæ.
		Internal complicated processes; shell thick	Thecideæ.

* In the Productus type of the Orthisidæ this character is sometimes obscure.

The relation of these families might be better shown by the following arrang-ment—the thick-shelled crania being evidently somewhat related to the Thecide as well as to the hingeless typ which precede it in the grouping Calceola stands apart, althoug with much that connects it, as a aberrant form, to the Orthisida The Thecideæ—in many respect aberrant types of the Terebratulid —form a transition-group to th Rudistea. See, further, the re marks at the close of Table II.

Lingulidæ.		
Discinidæ.		
		Craniadæ.
	Calceolidæ.	
Orthisidæ,		
Spiriferidæ.		
Rhynconellidæ.		
Terebratulidæ.		
		Thecideæ.

TABLE II.—*Genera of the Brachiopoda.*

Lingulidæ:—Shell corneous, or sub-corneous: nearly equivalve; hingeless; n true perforation.

Oblong, horny:—*Lingula* (including *Glossina*, Phillips). Lower Siluria upwards.

Orbicular or sub-orbicular*; calcareo-corneous:—*Obolus* (*Ungula*, Pander *Aulonotreta*, Kutorga). Silurian.

Discinidæ:—Shell corneous, or sub-corneous; hingeless: longitudinal slit or fora men in one valve.

Shell impunctate:—*Discina* (*Orbicula*, including also *Orbiculoidea* d'Orb, the *Schizotreta* of Kutorga). Lower Silurian, upwards.

Shell with surface punctures:—*Trematis* (*Orbicella*, d'Orbigny). Siluria

Shell coarsely punctured and spiny:—*Siphonotreta*. Silurian.

Appendix:—*Acrotreta*, Kutorga. Allied, according to Morris, t *Cyrtia*, in Family of the *Spiriferidæ*.

Craniadæ:—Shell thick; hingeless; orbicular; punctate; without foramen.

Crania (including *Pseudocrania*, McCoy). Silurian, upwards.

Appendix:—*Spondylobolus*, McCoy.

Calceolidæ:—Shell thick, fibrous. Receiving valve large and conical. Hinge-lin straight, with row of obscure teeth.

Calceola. Devonian.

Orthisidæ:—No internal shelly process: shell punctate; hinge-line straight.

§ 1. Shell bi-convex, or plano-convex; with area and foramen†. Greates width *generally* below the hinge-line.

Triangular foramen; no deltidium:—*Orthis*. Silurian to Carb. (or Permian ? This genus includes many so-called Spirifers and Terebratulidæ; and also, i part, *Orthambonites* and *Gonambonites* of Pander, and *Dicœlosia*, *Platystro-phia*, and *Schizophoria* of King.

Round foramen, unless closed by age; deltidium (or pseudo-deltidium):— *Orthisina* (*Pronites*, *Hemipronites*, Pander; *Streptorhynchus*, King). Siluria to Permian.

* McCoy and other palæontologists place some species of Obolus under Lingula—thu making orbicular as well as oblong lingulæ.

† Sometimes closed or rendered obscure by age.

§ 2. Shell concavo-convex, generally depressed; widest at hinge-line; narrow area, with deltidium or pseudo-deltidium; no spines. Beak of receiving valve often perforated by a minute foramen.

Strophomena (including Leptæna. Also Leptagonia, McCoy; *Peridiolithus*, Hüpsch; *Enteteles*, Fischer; *Plectambonites* and *Gonambonites*, in part, Pander; *Strophodonta*, Hall). Many palæontologists—McCoy, d'Orbigny, Pictet, &c.—separate Strophomena and Leptæna as distinct genera; but the opening in the beak of the former is often closed, and the curvature of the valves appears to be a character of uncertain value. Some species of Leptæna also, have a small foramen at the beak of the receiving valve.

Appendix:—*Davidsonia*, Bouchard, *Tropidoleptus*, Hall.

§ 3. Shell concavo-convex, with tubular spines.

Spines placed irregularly; area very narrow or obscure:—*Productus*, Silurian to Permian.

Spines placed irregularly; area broad, with pseudo-deltidium:—*Strophalosia*, King. (*Aulosteges*, Helmerson; *Orthothrix*, Geinitz. Including also King's *Leptænalosia*). McCoy makes this a sub-genus of his Leptæna. Devonian to Triassic.

Spines on hinge-margin of receiving valve only: *Chonetes*. Silurian to Permian.

Spiriferidæ:—Shell with internal spiral processes pointing outwards.

§ 1. Hinge-line more or less straight, with well-developed area but no deltidium.

Shell impunctate; opening triangular, slightly trenching on the entering valve:—*Spirifer* (*Delthyris*, Dalman; *Choristetes*, Fisher? *Trigonotreta*, Kœnig). Silurian to Triassic.

Shell punctate; opening triangular, bordered, and confined to receiving valve:—*Spiriferina*, d'Orb. (Includes many so-called spirifers.) Jurassic—apparently confined to the Lias beds.

Shell punctate or impunctate, pyramidal; opening small, generally obscured or altogether closed by the large pseudo-deltidium. Area very large:—*Cyrtia*. Davidson proposes to place the punctate species under *Spiriferina*.

§ 2. Hinge-line curved. Area generally wanting, but a deltidium usually present. Whole shell more or less terebratuliform in its aspect.

Shell impunctate. Small opening, generally closed, at extremity of beak. No deltidium. Area indistinct, or wanting:—*Athyris* (*Spirigera* d'Orb.; *Cleiothyris*, King). Silurian to Triassic.

Appendix:—*Merista*, Suess; *Meganteris (?)* Suess.

Shell impunctate, and much like *Athyris*, but with a deltidium of two united pieces, although this is often concealed:—*Spirigerina* (*Atrypa*, Dalman; *Cleiothyris*, Phillips; *Hipparionyx*, in part, Vanuxem). Silurian, Devonian.

Shell punctate, a round foramen at beak, and small triangular area:—*Retzia*. Silurian to Carboniferous (or Triassic?). Externally, this genus cannot be distinguished from many Terebratulæ.

Shell impunctate, with long incurved beak. No area, but large concave deltidium:—*Uncites* (*Gypidia*, in part, Dalman). Devonian.

Rhynconellidæ:—Shell impunctate, with slight internal processes. Hinge-line curved. Area wanting, or very narrow. Spiral arms in living species of Rhynconoella directed downwards and inwards.

No area. No internal septa. Incurved beak, small:—*Rhynconella.* (Including *Atrypa* of d'Orbigny, Pictet, &c.; also d'Orbigny's *Hemithyris* and *Acanthothyris*; with *Cyclothyris* of McCoy, &c.) Silurian, upwards. The so-called Atrypæ included here, are taken from the genus Spirigerina—comprising the forms without internal calcareous processes or perforation at beak.

No area. A septum in each valve:—*Camerophoria*, King. Carboniferous, Permian. Perhaps better placed as the type of a sub-group under Pentamerus.

No true area. Receiving valve divided by internal septa into three chambers. A large incurved beak:—*Pentamerus* (Gypidia, in part, Dalman). Silurian to Carboniferous.

A narrow area, and small foramen. Obscure internal septa:—*Porambonites.* (*Isorhynchus*, King). Lower Silurian. Placed by McCoy, on account of the area, in the family of the Orthisidæ.

Terebratulidæ:—Shell punctate. Entering valve with internal shelly loop.

Shell with prominent internal septa. Brachial support large and more or less complicated. Area; deltidium of two pieces; and triangular or round foramen:—*Sihngocephalus.* Devonian. Distinguished from Pentamerus by its punctured shell, area, deltidium, &c. Closely allied to the next genus, Terebratella.

Shell with internal septum, and double loop. Area and foramen: the latter truncating in part the beak of the receiving valve. Hinge-line nearly straight: —*Terebratella.* (*Rhynchora*, Dalman; *Magellanica*, Chemnitz; *Delthysidia*, McCoy; *Trigonosemus*, Kœniz; *Terebrirostra*, *Fissurirostra*, d'Orb.; *Magas*, Sow; *Lyra*; *Bouchardia*, *Morrisia*, *Kraussia*, *Kingena*, Davidson; *Ismenia*, *Megerlia*, King). Triassic (?) upwards.

Internal septum absent, or more or less rudimentary. No area. Hinge-line arched. Beak truncated by circular foramen:—*Terebratula*, including *Terebratulina*, d'Orb.; *Epithyris*, Phil.; *Eudesia* and *Waldheimia*, King. The latter are aberrant types approaching Terebratella). Devonian, upwards.

Appendix:—*Seminula*, McCoy (*Epithyris*, King). Palæozoic Terebratulæ, without any deltidium.

Shell thick, with one or more sub-marginal septa in entering valve. Hinge-line straight. Foramen large:—*Argiope* (*Megathyris*, d'Orb.) Cretaceous, upwards.

Thecideæ:—Shell, thick, punctate; with complicated internal processes and granulose margins. No foramen. (Attached by beak):—*Thecidea.* Triassic—upwards.

D'Orbigny and McCoy place the Family of the Thecideæ amongst the Rudistes; whilst many palæontologists suppress it as a family, and arrange Thecidea with the Terebratulidæ. Pictet, in the last volume of his Paléontologie (2nd ed.) issued a few months ago, separates it again from the latter, to place it between Terebratulidæ and Spiriferidæ. Its true position, however—passing from lower to higher

forms*—is evidently at the close of the series, as a transition-group to the Rudistes. This position, and the general arrangement of the families and genera as given above, has been adopted by the writer in his lectures during the last three or four years. E. J. C.

MATHEMATICS AND NATURAL PHILOSOPHY.

MOSER'S IMAGES AND A NEW ACTION OF LIGHT.

In the year 1842, Professor Moser, of Kœnigsberg, called attention to an interesting class of phenomena, to which his name has since been attached, under the title of "Moser's Images," although Dr. Draper, of New York, had, two years previously, announced his observation of similar facts. If a wafer or piece of money is laid on a plate of glass, and the glass breathed upon; then, after the breath has evaporated, and the object has been removed from the plate, although the eye can detect no trace, a renewed breathing will cause the spot where it rested to become visible. If the coin be breathed upon and laid upon the plate, and a few seconds be suffered to elapse, on removing the coin, although as before no trace can be perceived, on breathing on the plate, the image of the coin will be produced in minute detail. At first M. Moser was inclined to attribute these effects to differences of temperature, as he found that on placing the coin on a heated silver plate, the same effect was produced; and, also on reversing the experiment by placing a heated coin on a cold plate. He also found that, instead of the breath, the vapors of mercury, iodine, chlorine, and the like could be used; and thus he drew the general conclusion that "when a polished surface is put in contact with a body of different temperature, it acquires the faculty of condensing on portions of itself all kinds of vapors, and of fixing them either by adhesion or chemical combination." He however abandoned this hypothesis as too limited, and announced that mere contact, independently of difference of temperature, was sufficient to produce the effect, and he was thus able to imitate the action of light on the Daguerrian plates in profound darkness, and obtained images of various objects, laid on an iodised silver plate, in darkness, by afterwards subjecting the plate to mercurial vapor, or to the sunlight. Extending his researches, he found that the iodising of the plate was not essential to the photographic process of Daguerre; and that sunlight was capable of making an impression on polished plates of different kinds, which could be reproduced at pleasure by subjecting them to various vapors. Thus, placing a black screen out of which figures had been cut, before a well polished silver plate, and exposing it to sun-light, the figures were perfectly defined when the mercurial vapor was applied to the plate. When a plate of glass was similarly exposed, the breath alone was sufficient to render the figures visible, and they could be made to reappear at pleasure, even after a very long interval of time. Hence M. Moser inferred that "light acts on all substances, and its action can be rendered visible by aid of any vapor which adheres, or can be chemically combined with the substance," and of this general proposition, the

* Some Zoologists place the Brachiopoda higher in the scale than the Lammellibranchiata. The gradual assumption, however, of foot and branchiæ in the development of the latter, would appear to be opposed to this view.

grand discovery of Daguerre would be only a particular case. Still extending hi researches, M. Moser was led to a still more general inference, and the following may be taken as the type of the experiments leading thereto. A plate of agate on which had been engraved various figures, was placed at a distance of half a milli metre, in darkness, over a silver plate. After a few seconds, the plate was exposed to mercurial vapor, and a distinct image of the figures was the result. Hence he inferred the following proposition : " Any two bodies placed sufficiently near each other mutually impress one another with their own image." For the physical explanation of these phenomena, M. Moser was led to assert that all bodies are self luminous, and that they contain latent light correspondingly to latent heat. He seems in this to have been seduced by a tempting but imperfect analogy, and his views have not met with acceptance. Still more unfortunate, Dr. Draper imagined that the results were produced by a new quality of light, to which he gave the name of Tithonicity, but further researches by Snorr and R. Hunt, seemed to show that the active agent in the production of these images was *heat*, and under the name of Thermography, a new art was thus instituted, in the prosecution of which much success has been attained by various experimenters. The following strange and singular experiments by M. Nièpce de St. Victor, which have just appeared, decisively demonstrate that the conclusion above accepted by the scientific world is far too limited, and that bodies possess the power (somewhat allied to the known phenomena of phosporescence) of giving out light absorbed by them, and even of retaining this power for indefinite periods. The memoir was communicated to the Académie des Sciences, by M. Chevreul, and the following extracts are taken from a translation in the current number of the London Photographic Journal:

Will a body which has been subjected to the influence of light or insolation, preserve in darkness any effects (impression) of this light?

Such is the problem that M. Nièpce attempted to resolve by means of photography. The phosphorescence and fluorescence of bodies are known, but the following experiments have never been made until now. An engraving which had been kept for several days in darkness was exposed during a quarter of an hour to the action of direct solar rays, one half being covered with an opaque screen. The engraving was then laid upon a sheet of very sensitive photographic paper, and put in a dark place for twenty-four hours, and on being examined, it was found that the white portions of the engraving which had not been protected by the screen during its exposure to the sun, had been reproduced in black. When the engraving was kept in profound darkness for several days, and then applied to the paper without being previously exposed to the sun, no result was produced.

Certain engravings after being exposed to the action of light reproduce themselves better than others, according to the nature of the paper; but all papers, even Swedish filtering-paper with or without water-mark, reproduce themselves more or less after a preliminary exposure to the light. Wood, ivory, gold-beater's skin, parchment, and even the living skin, are also perfectly reproduced under the same circumstances; but not so metals, glass, and enamels. In exposing an engraving to the solar rays for a very long time, it becomes, if one may use the term, saturated with light. In this way it produces the maximum of effect, provided that it is suffered to remain in contact with the sensitive paper, in darkness, for two or three days.

If a sheet of glass be interposed between the engraving and the prepared paper,

no impression is produced. It is the same if a sheet of mica be substituted for the glass, or a sheet of rock crystal, or a yellow glass coloured with the oxide of uranium. An engraving covered with a layer of collodion or gelatine is reproduced but not if it be covered with picture-varnish or gum.

An engraving placed at a distance of three millimetres from the prepared paper is reproduced very well, and if it be a bold design, it is reproduced at a distance of one centimetre. The reproduction therefore is not the result of contact or chemical action. All the parts of an engraving colored with different colors are not produced with the same intensity; they vary according to the chemical composition of the colors: the same may be said of different kinds of inks. Vitrified characters traced upon a plate of varnished or enamelled porcelain are reproduced, but the porcelain leaves not the faintest trace; but if the porcelain be free from varnish or enamel, it leaves an impression, though a faint one.

If, after having exposed an engraving to the light for an hour, it is placed in contact with a piece of pasteboard which has been kept in a dark place for some days previously, and at the expiration of not less than twenty-four hours the pasteboard be brought into contact with the prepared paper, and allowed to remain thus for another twenty-four hours, the result will be the reproduction of the engraving—a little fainter, it is true, than if the engraving had been applied directly, but still distinct. Likewise if a tablet of black marble dotted with white spots be exposed to the light, and then applied to the prepared paper, the white spots alone will produce an impression. Under the same conditions, a tablet of white chalk will leave a visible impression, whereas one of black charcoal makes none whatever. A black and white feather exposed to the sun, and applied in the same manner, produced the same results.

The author drew particular attention to the following experiment, which is perhaps the most curious and the most important. He took a metal tube (any other opaque substance in the form of a tube answers the same purpose) closed at one of its extremities, and lined with white paper or cotton, and exposed the open end to the direct solar rays for about an hour; after the insolation he applied the same end to a sheet of prepared paper, and found after the lapse of twenty-four hours that the area covered by the tube had been darkened. More than that, an engraving on Chinese paper interposed between the tube and the prepared paper, was itself reproduced.

If the tube be hermetically closed immediately on being withdrawn from the light, it will preserve for an indefinite period the power of radiation communicated to it by insolation.

A piece of white card placed in a dark room into which an image vividly illuminated by the solar rays was thrown, was found after a three hours' exposure to give a faint representation of the object upon the prepared paper, after twenty-four hours' contact.

It remains only to speak of the result of experiments made with fluorescent and phosphorescent bodies:—A design traced upon a sheet of paper with a solution of sulphate of quinine (one of the most fluorescent bodies known,) and exposed to the sun, then placed in contact with the prepared paper, will reproduce itself in a much more intense black than the paper on which it is traced. A sheet of glass, however, placed between the design and the prepared paper, prevents

any impression from being produced, nor will any impression be produced if t
design be not exposed to the action of the sun previous to contact.

A luminous design traced with phosphorus upon a sheet of white paper, w
without previous exposure to the light, act very quickly upon the prepared pap
but not through glass.

M. Nièpce concludes his paper, which was received with lively interest by
Academy, thus :—"Such are the principal facts I have observed. I have not spa
to enumerate all the experiments I have made; there are many others to be ma
therefore I hasten to publish this paper without waiting to complete it. I may
permitted I hope, to believe that my new discoveries of the properties of lig
scarcely suspected or imperfectly verified up to the present, will excite the att
tion of natural philosophers and lead to important results."

J. B. C

MISCELLANEOUS.

Dr. Charles Mackay, in his tour through the States, continues to receive a m
cordial and hearty welcome; and in his own genial way, responds in equally w
set prose and rhyme, to the friendly greetings of his American hosts. On
14th of January he was entertained at a public dinner at Washington, where d
tinguished senators, and representatives of American Literature, united to g
brilliancy and interest to the reception of the British Poet. In return for a w
come so gracious and friendly, Dr. Mackay repaid them in full, in the currency
Parnassus. General Shields, who presided, having proposed, in a few grace
and appropriate remarks, a sentiment of welcome to their guest, instead of
sponding in the established common-places of prose, and declaring "the pres
the proudest moment of his life!" &c., &c., Dr. Mackay delighted the compa
by reciting the following humorous and genial poem, embodying a pleasant a
gory of the first fruits of the anticipated triumph of science, in the success
completion of the submarine Atlantic Telegraph:

JOHN AND JONATHAN.

Said brother Jonathan to John,
"You are the elder born,
And I can bear another's hate,
But not your slightest scorn.
You've lived a life of noble strife,
You've made a world your own,
Why, when I follow in your steps,
Receive me with a groan?

"I feel the promptings of my youth,
That urge me evermore
To spread my fame, my race, my name,
From shore to furthest shore.

I feel the lightnings in my blood,
  The thunders in my hand,
And I must work my destiny,
  Whoever may withstand.

"And if you'd give me, brother John,
  The sympathy I crave,
And stretch your warm fraternal hand
  Across the Atlantic wave,
I'd give it such a cordial grasp
  That earth should start to see,
And ancient crowns and sceptres shake
  That fear both you and me."

Said brother John to Jonathan,
  "You do my nature wrong;
I never hated, never scorned,
  But loved you well and long.
If, children of the self-same sire,
  We've quarrelled now and then,
'Twas only in our early youth,
  And not since we were men.

"And if with cautious, cooler blood,
  Result of sufferings keen,
I sometimes think you move too fast,
  Mistake not what I mean.
I've felt the follies of my youth,
  The errors of my prime,
And dreamed for you—my father's son—
  A future more sublime.

"And here's my hand, 'tis freely given,
  I stretch it o'er the brine,
And wish you from my heart of hearts
  A higher life than mine.
Together let us rule the world,
  Together work and thrive;
For if you're only twenty-one,
  I'm scarcely thirty-five.

"And I have strength for nobler work
  Than e'er my hand has done,
And realms to rule and truths to plant
  Beyond the rising sun.
Take you the West and I the East,
  We'll spread ourselves abroad,
With trade and spade, and wholesome laws,
  And faith in man and God.

"Take you the West and I the East,
We speak the self same tongue
That Milton wrote and Chatham spoke
And Burns and Shakespear sung;
And from our tongue, our hand, our heart,
Shall countless blessings flow,
To light two darkened hemispheres
That know not where they go.

"Our Anglo-Saxon name and fame,
Our Anglo-Saxon speech,
Received their mission straight from Heaven
To civilize and teach.
So here's my hand, I stretch it forth;
Ye meaner lands look on!
From this day hence there's friendship firm
'Twixt Jonathan and John!"

They shook their hands, this noble pair,
And o'er the "electric chain"
Came daily messages of peace
And love betwixt them twain.
When other nations, sore oppressed,
Lie dark in sorrow's night,
They look to Jonathan and John
And hope for coming light.

CANADIAN INSTITUTE.

Session—1857-58.

FIRST ORDINARY MEETING—*5th December*, 1857.

Professor E. J. Chapman, Vice-President, in the Chair.

I. *The following Gentlemen, provisionally elected by the Council during the recess, were Balloted for and declared duly elected Members:*

J. Ardagh, M.D., Orillia, C.W.
R. Barrett Bernard, Esq., Barrie, C.W.
Thos. Hector, Esq., C.E., Toronto.
W. A. Watts, M.A., Toronto.

II. The donations to the Library and Museum received since the last ordinary meeting were announced. The thanks of the Institute were voted to the donors, and detailed lists, with the Donor's names, were ordered to be inserted in the Annual Report of the Council.

III. *The following Papers were read:*

1. By Sir W. E. Logan, F.R.S.:
"On the relative dates of various intrusive rocks cutting the Laurentian series in Canada West."

2. By B. O'Hara, Esq.:

"On a new form of application of Propelling power to Steamships."

3. By Prof. Wilson, LL.D.:

"On some Ethnographic phases of Conchology."

SECOND ORDINARY MEETING—12*th December*, 1857.

Professor E. J. Chapman, Vice-President, in the Chair.

I. *The following Gentlemen were elected Members:*

Alexander Marling, Esq., Toronto.
Farquhar McGillivray, Esq., B.A., Cornwall, C.W.
Neil McLean Trew, Esq., B.A., Windsor, C.W.
Thos. G. M. Cottle, Esq., Toronto.

II. *The following donations for the Museum were announced, and the thanks of the Institute voted to the donors:*

1. Anonymous.

A Bird's Nest of remarkable construction, from the neighbourhood of Calcutta.

2. From C. Rankin, Esq., per A. Russell, Esq.

A piece of Elastic Sandstone from Delhi.

III. *The following Papers were read:*

1. By the Rev. Professor W. Hincks, F.L.S.:

"Notices respecting the Flora of Western Canada, and especially of the neighbourhood of Toronto."

2. By the Rev. J. McCaul, LL.D.:

"Notes on Latin Inscriptions found in Britain." Part I.

IV. The requisite nominations of office-bearers for the ensuing year were made, and the Vice-President announced the Annual General Meeting to be held on the 19th inst., to receive the Report of the Council, elect the Officers and Members of Council for the ensuing year, and for other business.

ANNUAL GENERAL MEETING—19*th December*, 1857.

Professor E. J. Chapman, Vice-President, in the Chair.

I. The Report of the Council for the year 1856-57, was read as follows:

ANNUAL REPORT OF THE COUNCIL, 1857.

The Council of the Canadian Institute, in fulfilment of the duty devolving upon them at the expiration of their year of office, have the honor to lay before the Members the following Report, embodying a statement of the present condition of the Institute, and of its proceedings during the past Session.

In submitting this Report, the Council have much pleasure in being able to call attention to the very satisfactory condition of the Institute generally.

The constant accession of new members, the numerous and valuable donations presented to the Library and Museum, the comparatively large and increasing attendance at the Meetings of the Session, the character of the Papers communicated at these Meetings, and finally, the continued success of the Journal of the Institute, are each and all, it is submitted, legitimate subjects of congratulation;

shewing, as these facts most assuredly do, the honorable position accorded t Institute in the estimation of the Province.

The following statement exhibits the alteration in the Roll of Membership

Number of Members at the commencement of present Session.....		57
New Members elected during the Session..................	50	
" " by Council during the Recess	4—	5
		62
Members deceased, 4; left the Province or withdrawn	11—	1
Total number now on the books of the Institute		61

Although the increase in the number of Members is below that of the las sion, it is still sufficiently large to be deemed satisfactory; being, in fact, con ably above the average annual returns of many of the long incorporated and successful Societies of Europe.

In the following list, an enumeration is given of the various works added Library by purchase during the past year:—

BOOKS PURCHASED FOR THE LIBRARY.

Books marked (*) are in parts, or unbound.

Encyclopædia Britannica. Vols. XI., XII, XIII. and Supplement.
Notes and Queries. Vol. I., 2nd Series. January to June, 1856.
Orr's Circle of the Sciences—Practical Chemistry.
Earl Stanhope's (L. Mahon's) History of England. Vols. V., VI. and
Hugh Miller's Testimony of the Rocks.
Morton's Crania Americana.
Morton's Crania Ægyptiaca; or Observations on Egyptian Ethnogr
Johnson's Physical Atlas. Imperial folio. Enlarged edition, 1856
Crania Britannica. Decades I. and II.
Blodget's Climatology of the United States.
Indigenous Races of the Earth; or New Chapters of Ethnological In
History of Civilization in England. By H. T. Buckle, 1857. Vol.
Memoirs of Sir Isaac Newton. By Sir David Brewster. 2 vols.
Visite à l'exposition universelle de Paris en 1855.
Monumenta Historica Britannica.
Edgar A. Poe's Miscellaneous Works. 4 vols.
Arago's Biographies of Distinguished Men.
Marryat's Pottery and Porcelain.
Life of George Stephenson.
Schoolcraft's Iroquois Indians.
Gray's Botanic Text Book.
Gray's Manual of Botany.
Westwood on Insects. 2 vols.
Herring on Paper Making.
Gosse's Canadian Naturalist.
Memorials of A. Crosse, Electrician.
Fairbairn's Information for Engineers.
Schoolcraft's Thirty Years with the Indian Tribes.
Masson's Essays on English Poets.

Carpenter on the Microscope.
Lindley's Vegetable Kingdom.
Ruskin's Seven Lamps of Architecture.
Catlin's North American Indians. 2 vols.
Lardner's Works—Natural Philosophy. 3 vols.
Lardner's Astronomy. Vol. I.
*Tobacco: Its History and Cultivation.

Architectural Publication Society:—
Illustrations. 5 Vols., 1848-54. Parts I. and II. Vol. 6.
Architectural Dictionary.

* *Quarterly Journal of the Geological Society*:—
Vols. XII. XIII. Parts, Nos. 47-49-51.

* *Quarterly Journal of the Chemical Society*:—
Vols. IX. X. Parts, Nos. 35-37.

* *Quarterly Journal of Microscopic Science*:—Nos. 17-21.

* *The London, Dublin, and Edinburgh Philosophical Magazine and Journal of Science*:—Vols. XII. XIII. Nos. 78-93.

* *Edinburgh New Philosophical Journal*: Vols. IV. VI.

* *The Chemical Gazette*:—Nos. 321-359.

Amongst the valuable donations made to the Library during the past Session, the Council cannot refrain from alluding more particularly to Gould's magnificent work on the Trochilidæ, presented to the Institute by the liberality of one of its late Presidents, G. W. Allan, Esq., to whom the Institute is also in other respects so largely indebted. The best thanks of the Institute are likewise again due to the Hon. J. M. Brodhead of Washington, H. G. Bohn, Esq., of London, and other well-wishers, for their acceptable contributions, as recorded in the annexed list:—

DONATIONS TO LIBRARY SINCE LAST REPORT.

Those marked * are in parts, or pamphlets, and unbound.

FROM OFFICE OF ROUTINE AND RECORDS—PROVINCIAL GOVERNMENT.

*Return to an address of the Legislative Assembly, 5th May,—in reference to Purchase of Water and Beach Lots at Quebec.
*Public Accounts for year 1856.
*Annual Report of the Postmaster General, 1856.
*Report of the state of the Militia of the Province, 8th January, 1857.
*Report of Count De Rottermund on the Mines of Lake Superior and Huron.
*Report of Commissioners of Inquiry in re Corrigan Murder, July, 1857.
*Summary of the Proceedings of the Legislative Assembly of Canada, 3rd Sess., 5th Parliament, 1857, from 26th February to 10th June.
*Extract from Return to an Address, &c., to report on Quebec and Point Levi Roads.
Canada at the Universal Exhibition, 1855, Paris. Two copies.

FROM THE TRUSTEES OF THE NEW YORK STATE LIBRARY.

*Annual Report of the Trustees. New York State Library, 22nd January, 1856.
*Science and Religion—M. Hopkins, D.D.
*Religious bearings of Man's Creation—E. Hitchcock, D.D. Two copies.
*Eulogy on the Life and Character of Dr. T. R. Beck.
*Index to the Laws of the State of New York, 1842 to 1855 inclusive—Bogart.

*Inauguration of the Dudley Observatory, Albany.

*Relations of Science and Religion—Discourse delivered before the Americ Association by Rev. J. H. Hopkins, D.D., LL.D., 1856.

*Tenth Annual Report of the Regents of the University of the State of Ne York, &c.

New York State Library Catalogue, in two Vols.

New York State Library Catalogue, No. 3, Maps, Manuscripts, Medals, &c., 185

New York Meteorology, 1826 to 1850—Hough.

Documents relating to the Colonial History of the State of New York—Hollan Documents, 1603-1656—E. B. O'Callaghan, M.D., LL.D. Vols. I. III. I and VII.

Documents relating to the Colonial History of the State of New York. Edit by E. . O'Callaghan, M.D., LL.D. Vol. VIII.

FROM THE BUREAU OF AGRICULTURE.

Essay on the Insects and Diseases injurious to the Wheat Crops. By H. Hind, Esq., M.A., Prof. of Chemistry, Trinity College, Toronto. Two copie

FROM CHIEF SUPERINTENDENT OF EDUCATION, UPPER CANADA.

*Report on Education in Upper Canada, omitting the Statistical Tables an Appendix.

*Journal of Education for the year 1857. Two sets.

FROM CHIEF SUPERINTENDENT OF EDUCATION, LOWER CANADA.

*Journal of Education, for the year 1857. Two sets.

*Journal de l'Instruction Publique, do. do.

FROM OFFICE OF CANADA GAZETTE.

Tables of the Statutes in Force, or which have been in Force in Upper Canada, i their Chronological Order, &c. &c., to the end of the Session, 1856.

FROM E. B. O'CALLAGHAN, M.D., LL.D.

Transactions of the American Institute from 1846 to 1854, inclusive.

FROM MESSRS. HARPER AND BROTHERS, NEW YORK.

Human Physiology, Statistical and Dynamical, or the Condition and Course of Man—By J. H. Draper, M.D., LL.D.

New Granada—By Isaac F. Holton, M.A., with Maps and Illustrations.

Beaumarchais and His Times—French Society in the 18th Century.

Lake Ngami—By Charles J. Anderssen.

Notes on Central America, with Maps and Illustrations—By E. G. Squier.

FROM MESSRS. DIX, EDWARDS & CO, NEW YORK.

Lake Ngami—By Charles J. Anderssen.

FROM F. W. CUMBERLAND, ESQ., TORONTO.

Memorials of Edinburgh in the Olden Time—By Daniel Wilson, F.R.S., S.A., &c, Two volumes.

FROM HON. J. M. BRODHEAD, WASHINGTON.

Map of the Strait of Mackinac, &c.—By Lt. Col. Kearney and Capt. Macomb, 1849-51.

United States Japan Expedition; Zodiacal Light, &c.—By Rev. G. James, A. M. Vol. III.

Patent Office Reports. 1855, Agriculture.

Regulations for Consular Officers of the United States—Department of State, 1856.

Report from the Register of the Treasury of the Commerce and Navigation of the United States for year ending 30th June, 1856.

Report of the Secretary of the Treasury of the United States on the State of Finances for the year ending 30th June, 1856.

Statstical Report on the Sickness and Mortality in the Army of the United States, from January 1839 to January 1855—Prepared by Brevet Brigadier General Thomas Lawson, Surgeon General United States Army, and R. H. Cooledge, M.D., Assist. Surgeon United States Army.

United States Naval Astronomical Expedition to the Southern Hemisphere during the years 1849-52. Vol. VI.

Report of the Secretary of War, U. S., respecting the purchase of Camels for the purposes of Military Transportation, 1855-7.

Report on the Commercial Relations of the United States with all Foreign Nations—E. Flagg, Superintendent. Vol. I. Digest, and Vol. III.

Report of Decisions of the Commissioners under the Convention of February 8, 1853, between Great Britain and the United States, August 11, 1856.

Report of the Commissioners of Indian Affairs accompanying the Annual Report of the Secretary of the Interior for the year 1856.

Shells and Shell Guns—By J. A. Dahlgren, Commander in charge of Experimental Ordnance Department, Navy Yard, Washington.

Report on Kansas Affairs—House of Representatives, July, 1856.

Report of Explorations and Surveys to ascertain the most practicable and economical route for a Railroad from the Mississippi River to the Pacific Ocean, according to Acts of Congress, March 3, 1853, May 31, 1854, and August 5, 1854. Vol. II.

General Regulations under the Revenue and Collection Laws of the United States Treasury Department, 1857.

General Regulations, No. 54, under the Provisions of the Warehouse Laws, and for other purposes—Treasury Department, July 2, 1855.

General Regulations, No. 67, under the Provisions of the Laws in relation to the Revenue, Marine, Cousul and Commercial Agents, &c. &c.—Treasury Department, June 1st, 1856.

General Regulations, No. 63. Abstract of Decisions on Questions submitted to the Treasury Department arising under the Laws affecting Revenue and Commerce in force since December 1, 1836, and under Treaty stipulations with Foreign Powers. Treasury Department, February 1, 1856.

United States Japan Expedition—Com. M. C. Parry. Vol. II. With Illustrations.

*United States Official Army Register, 1857.

* " " Navy " 1857.

Geology of Lake Superior Region. Parts I. and II.—Foster and Whitney.

Report on the Geological and Mineralogical Survey of the Mineral Lands of the United States in the State of Michigan—By C. T. Jackson.

FROM MESSRS. D. APPLETON & CO., NEW YORK.

Milledulcia—A Thousand Pleasant Things selected from Notes and Queries.

FROM OBSERVATORY AT HARVARD COLLEGE.

*Annals of the Astronomical Observatory of Harvard College. Vol. I., Part

FROM A. H. ARMOUR, ESQ., TORONTO.

*Montreal in 1856—Sketch prepared for the Celebration of the opening of t Grand Trunk Railway.

*Almanach de Gotha, 1856.

*Outlines of the Geology of Ohio—By C. Whittlesey, with Map.

*Natural History of Vermont—Lecture by Zadock Thompson.

*Preliminary Report on the Geology of Vermont.

Boston Business Directory, 1857.

FROM W. B. SULLIVAN, ESQ., TORONTO, AUTHOR.

*Sketch of the Montreal Celebration of the opening of the Grand Trunk Rai way, 1856.

FROM THE AUTHOR, SIR G. SIMPSON.

Overland Journey Round the World—years 1841 and 1842.

FROM MESSRS. PHILLIPS, SAMPSON & CO., BOSTON.

History of the Reign of the Emperor Charles the Fifth. By W. Robertson, D.I With additions by W. H. Prescott. Three vols.

Religious Truth Illustrated from Science, in Addresses and Sermons on speci occasions. By Edward Hitchcock, D.D., LL.D., Professor of Geology Amherst College.

Biographical Essays. By Henry T. Tuckerman.

FROM MESSRS. GOULD AND LINCOLN.

Annual of Scientific discovery, 1857.

FROM FRANKLIN INSTITUTE, PHILADELPHIA.

Report on the 25th Exhibition of American Manufactures, held in the City o Philadelphia, 11th to 29th Nov., 1856.

Journal of the Institute, for year 1857.

FROM H. G. BOHN, ESQ., LONDON, PER A. H. ARMOUR, ESQ.

Critical Essays, contributed to the Eclectic Review. By John Foster. Edited by J. E. Ryland, M.A. Vol. I.

History of the Conquest of England by the Normans; its causes, and its consequences in England, Scotland, and Ireland, and on the Continent. By Augustus Thierry. Translated, from 7th Paris Edition, by W. Hazlitt. Vols. I. and II.

History of Civilization, from the fall of the Roman Empire to the French Revolution. By F. Guizot. Translated by W. Hazlitt, in 3 vols. Vols. I. II. & III.

The Complete Angler; by Izaak Walton and Charles Cotton; with lives of the Authors. Edited by Ed. Jesse, and H. G. Bohn.

Blairs' Chronological Tables, revised and enlarged, to the Russian Treaty of 1856. By J. Willoughby Rosse.

Masterman Ready. By Capt. Marryat. With 93 engravings.

Lives and Works of Michael Angelo and Raphael. By R. Duppa and Q. de Quincy.

Memoirs of the Duke of Sully, Prime Minister to Henry the Great. In four vols,

Quintilian's Institutes of Oratory—literally translated—by Rev. John S. Watson. M.A., M.R.S.L.

The Natural History of Pliny. Translated by John Bostock, M.D., F.R.S., and H. T. Riley, Esq., B.A. Vol. V.

Dictionary of Latin Quotations, Classical and Mediæval; with a Selection of Greek Quotations. By H. T. Riley, B.A.

Orations of Demosthenes, against Leptines, Midias, Androtion, and Aristocrates. Translated, with Notes, &c., by Charles Rann Kennedy.

*The Crystal Palace Company, Deeds of Settlement, Royal Charter, and List of Shareholders, January, 1856.

The Life of George Washington. By W. Irving. Vol. III. American War, Years 1777-1778-1779.

FROM THE SOCIETY OF ARTS, LONDON.

*Address on the Opening of 103rd Session; delivered by Col. Sykes, F.R.S.

**List of Officers and Committees, Parliamentary and of reference.

Journal of the Society, for years 1856-7. Two copies.

FROM L. A. HUGUET LATOUR, ESQ., MONTREAL.

*Twenty-eighth Annual Report of Natural History Society, Montreal, May, 1856.

FROM BOARD OF AGRICULTURE, UPPER CANADA.

Traactions of the Board, for year 1856.

FROM SANDFORD FLEMING, ESQ., C.E., TORONTO.

*Preliminary Report on the Projected North Western Railway of Canada.

FROM THOS. HENNING, ESQ., TORONTO.

Villas and Cottages: a Series of Designs prepared for execution in the United States. By C. Vaux.

FROM G. W. ALLAN, ESQ., TORONTO.

A Monogram of the Trochilidæ or Humming Birds. By John Gould, F.R.S Fourteen Parts. (*To be continued.*)

FROM THE AUTHOR.

Surnames. By B. Homer Dixon, Esq., Boston. For private distribution.

FROM MAJOR RAINS, ISLAND ST. JOSEPH.

Il Decamerone di Messer Giovanni Boccaccio, 1789.

Origine de Cavalieri di Francesco Sansovino. Venetia, 1566.

L'Arcadia di Iacomo Sannazaro, di nuovo riveduta corretta et adornata di varie figure. 1599.

FROM LEGISLATIVE ASSEMBLY.

Journals of Legislative Assembly. Vols. XII. to XV.

Index to Vol. XIII., Appendices.

General Index Journals of House of Assembly, Canada, 1841-1851.

Canada at the Universal Exhibition, Paris, 1855. Translation.

Statutes of Canada, 1857.

FROM MECHANICS' INSTITUTE, TORONTO.

*Report of the General Committee, Annual Meeting, &c., 1857.

FROM CROWN LAND DEPARTMENT, PER A. RUSSELL, ESQ., A.C.C.L.

*Report of the Commissioner of Crown Lands of Canada for the year 1856. 2n Edition.

Appendix to Report of the Commissioner of Crown Lands, Part II. *Maps o Canada.*

FROM LEONARD SCOTT & CO., N. YORK, PER A. H. ARMOUR, ESQ.

*Edinburgh, Westminster, North British, and Quarterly Reviews for 1857.
*Blackwood's Magazine do

FROM SECRETARY OF THE COMPANY.

*Illinois Central Railroad Company, &c.
*Reports and Accounts of do. to 31st December, 1856.

FROM THE AUTHOR, DR. MORRIS, TORONTO.

*Observations on the Construction of Hospitals for the Insane.
*A Theory as to the Proximate Cause of Insanity, &c.

FROM THE AUTHOR, THOS. HODGINS, B.A., TORONTO.

*The Canada Educational Directory and Calendar for 1857–8.

FROM THE AUTHOR, J. RORDANS, ESQ., TORONTO.

*The Upper Canada Law Directory for 1857.

FROM G. P. URE, ESQ., TORONTO.

An Argument, Legal and Historical, for the Legislative Prohibition of the Liquo Traffic, by Dr. F. R. Lees.

FROM THE AUTHOR, J. AITKEN MEIGS, M.D.

Catalogue of Human Crania in the Collection of the Academy of Natural Science Philadelphia, based upon Dr. Morton's Catalogue of Skulls, &c.

FROM THE PUBLISHER, JOHN LOVELL, ESQ., MONTREAL.

Canada Directory for 1857–58.

FROM HON. EAST INDIA COMPANY.

Meteorological Register kept at the Hon. East India Company's Observatory at Madras, from years 1822–1843.

*Astronomical Observations made at the Hon. East India Company's Observatory at Madras, in the years 1843–1847; together with the recomputation of the Sun and Moon and Planetary Observations since 1831, by Thomas Glanville Taylor, Esq., F.R.S. and F.R.A.S., Astronomer to the Honorable Company.

*Ditto, by Capt. W. K. Worster, Artillery, F.R.A.S., Acting Astronomer, and W. Stephen Jacob, Esq., F.R.A.S., Astronomer to the Hon. Company for the years 1848–1852.

Also Two Plates, Jupiter and Mars.

FROM MAJOR GENERAL SABINE, R. A., PER PROF. CHERRIMAN, M.A.

Magnetical and Meteorological Observations made at Toronto, Canada, Vol. III, 1846–7 and 8, with abstracts to 1855, inclusive. By Major Gen. E. Sabine, R.A

FROM SMITHSONIAN INSTITUTION, WASHINGTON.

Patent Office Reports, 1853–5, Agricultural, Mechanical, Vols. I. and II.
Do do 1854–5, Mechanics.

*Account of Smithsonian Institute, its Founder, Building Operations, &c. By W. S. Rhees.

Smithsonian Contributions to Knowledge, Vol. IX.
*Annual Report of the Board of Regents of the Smithsonian Institution, 1855–6.
*Catalogue of North American Mammalia in Museum of the Institute.

FROM THE SOCIETIES.

*Annale des Mines ou Recueil de Mémoires sur l'exploration des Mines et sur les Sciences et les Arts qui s'y Rapportent; rédigées par les Ingénieurs des Mines, et publiées sous l'autorisation du Ministre des Travaux Publics. Cinquième Série, Tomes VI.–X., 1854–56.
*Bulletin de la Société Géologique de France. Tomes XII.–XIV., 1855–56.
*Table Générale des Articles contenus dans le volume.
*Catalogue de la Maison Eloffe et Cie., Naturalistes, 24 pages.
*Notice Biographique sur M. de Boissy par M. D'Archiac.
*Notice sur la Vie et les Travaux de Jules Haimé par M. D'Archiac.
*Quarterly Journal of the Geological Society, England, 1856–57. No. 47–49.
*Journal of the Royal Geographical Society, Vol. XXVI., 1856.
*Address at Anniversary Meeting by Rear Admiral Beechy, V.P.R.S., 1856.
Proceedings of the Royal Geographical Society, 1857, Nos. VI.–IX.
*Journal of Geological Society of Dublin. Vol. I.—Parts 2, 3, and 4 (Part 1 deficient.) Vol. II.–VI., 1848–55. Vol. VII. One part, March, 1855.
*Transactions of the Literary and Historical Society of Quebec. Feb., 1856.
*Transactions of the Jamaica Society of Arts. Vols. I. and II., 1854–5 and 1856.
*Annals of the Lyceum of Natural History, New York. Vols. I. to V., and Parts I. to VII. of Vol. VI.
*Constitution and By-laws of the New Orleans Academy of Sciences, 1854.
*Proceedings of the New Orleans Academy of Sciences. Vol. I., March 1, 1854.
*Annual Address read before the New Orleans Academy of Sciences, February 25, 1856, by Prof. J. L. Riddell, University of Louisiana. Through L. A. Huguet Latour, Esq., Montreal.
*Boston Natural History Society, Proceedings of. Pages 97 to 240.
*Queen's Bench Reports, per H. Rowsell, Esq.
PERIODICALS—BOUND AND ADDED TO THE LIBRARY SINCE LAST ANNUAL REPORT 38 Vols.

The number of Works belonging to the Library of the Canadian Institute amounts at present to nearly two thousand volumes. Many of these works consist of expensive and valuable books of reference; and as the entire Library has now been re-arranged and catalogued by the zealous exertions of Professor Croft, the Honorary Librarian appointed at the last election of Officers, it affords to Members a readily available source of information—of a character not likely to be found in ordinary libraries—on various subjects of both special and general interest. It may not be amiss to repeat here, as stated in the last Report, that a book has been opened, in which Members can enter the title of any work they may wish to recommend to the Council for purchase.

The specimens presented to the Museum of the Institute since the date of the last Report, are enumerated in the following list:

DONATIONS TO THE MUSEUM.

FROM JOHN HEAD, ESQ., TORONTO.

Large Stone Gouge, dug up in Canada West.

FROM PROFESSOR HIND, M.A.

A Trilobite Bed—Utica Slate from the Blue Mountains, Collingwood.
Graptolite Bed—Hudson River Group, from Humber River, near Toronto.
Fucoid and Ripple Marks,—Hudson River Group, Humber River.
Black River and Birds-eye Limestone, from Lake Couchiching.
Tracks of Crustacea—Potsdam Sandstone, Beauharnois.
Large Single Trilobite.

FROM MAJOR F. WELLS, 1ST ROYAL REGIMENT.

A Stone Hammer picked up in the third parallel, left attack, of the Trenc Sebastopol, about three feet six inches under ground.

FROM MAJOR RAINS, ST. JOSEPH'S ISLAND, C.W.

Greek Coins, Silver, 10; Brass, 36	46
Roman Coins, Silver, 61: Brass, 53	114
Mediæval and Modern Coins, Gold, 1; Silver, 40; Copper, 72	113
Brunel Medal	1
Total	274

Specimens of Lapis Lazuli, Copper, and Copper Ore, from Bruce Mines.

FROM ANGUS McINTOSH, ESQ., PER J. THOMPSON, ESQ.

Several specimens of Copper Ore and Virgin Copper, &c., viz.:
Five specimens—Crystalline Copper and Quartz, from Wellington Mines.
Samples 1, 2 and 3 Washing of Crushed Copper Quartz, Bruce Mines.
Nine specimens of Copper Ore and Quartz, Bruce Mines.
Eight specimens of Copper Ore from the Bruce Mines.
Forty-one specimens of Fossils, from Manitouwaning, Manitoulin Island.
Two specimens of Iron Ore, from Lake Superior Mines.
One specimen of Silver from same place.
One specimen Conglomerate Rock, from Sault St. Marie.
One specimen Grey Copper. from Wellington Mines, near the Bruce, Lake H
Four specimens of Native Copper, from Mines on Lake Superior.
One specimen of Dry Crushed Copper, from Bruce Mines.
Nineteen specimens of Crystalline Copper Quartz, from the Bruce Mines.

FROM DR. GIBB, LONDON.

Concretions from Buckinghamshire, England.
Six Bottles with specimens of Reptiles from the Valley of Inkerman, Crimea
Nineteen Snakes, various; three Lizards, various; three Millepedes; three C pedes.
Also a specimen of a Pipe Fish, and of a Centipede Cricket.

The subjoined list contains the titles of the various Papers read at the ord Meetings of the Session, 1856–57:

COMMUNICATIONS.

Capt. Kennedy.—"On the Proposed Expedition to the Arctic regions in fu search of the records or remains of Sir John Franklin." 6th December, 185

Rev. W. A. Adamson, D.C.L.—On the Decrease, Restoration and Preserv of the Salmon in Canada." 6th December, 1856.

Prof. Chapman.—"On some Trilobites found at Whitby, Canada West." December, 1856.

James Gilbert, Esq.—On the Arizona Copper Mines." 13th December, 1856.

Prof. Croft,, D.C.L.—"Note on the Oxalate of Manganese." 20th Dec., 1856.

Joseph Robinson, Esq.—"On preserving Timber from decay." 20th Dec., 1856.

The Hon. the Chief Justice Draper, C.B.—"Annual Address." 10th Jan., 1857.

Prof. Bovell, M.D.—"On Cell Development." 10th January, 1857.

Rev. Prof. Hincks.—"On Cell Development, in reply to the Paper read by Professor Bovell at the previous meeting." 17th January, 1857.

Col. Baron de Rottenburg, C.B.—"On the General Telescopic aspect of the Five Primary Planets, including the Planet Mercury." 17th January, 1857.

John Langton, M.A.—"On a small Capillary Wave hitherto undescribed." 17th January, 1857.

Prof. Wilson, LL.D.—"On the Mediæval Pageant of the Dance of Death." 17th January, 1857.

Prof. Kingston, M.A.—"On some Practical Applications of the Electric Telegraph." 24th January, 1857.

Prof. Chapman.—"On some Crystals of Carbonate of Lime, from South Africa." 24th January, 1857.

Prof. Wilson, LL.D.—"Traces of the early use of Pipes and Tobacco among different races." 31st January, 1857.

Prof. Wilson, LL.D.—"On the customs, usages, and superstitions of the Old and New Worlds, in relation to Tobacco and other Narcotics." 7th February, 1857.

Rev. Prof. Hincks.—"Notes on the Strigidæ found in the neighbourhood of Toronto." 7th February, 1857.

John Langton, M.A.—"On the early French discoveries in North America." 14th February, 1857.

Prof. Chapman.—"Remarks on the classification and leading characteristics of Palæozoic Corals." 14th February, 1857.

Patrick Freeland, Esq.—"On a new traversing stage for the Microscope." 21st February, 1857.

Prof. Kingston, M.A.—"Report on the Meteorological Observations made during the year 1856." 21st February, 1857.

W. G. Tomkins, C.E.—"On the Preservation of Timber." 21st February, 1857.

T. S. Stratford, M.D., New Zealand.—"Notes on the Natural History of New Zealand." 28th February, 1857.

Rev. Prof. Young, M.A.—"On Sir David Brewster's (Supposed) Law of Visible Direction in Monocular Vision, and the Corresponding Law of Visible Direction in Binocular Vision." 7th March, 1857.

Col. Baron de Rottenburg, C.B.—"Proposition from Lieut. Ashe, R.N., to establish an Astronomical Observatory at Quebec." 7th March, 1857.

J. H. Morris, M.A.—"Notes of Travel in China." Part I. 14th March, 1857.

Col. Baron de Rottenburg, C.B.—"Report of Committee on Prof. Kingston's Paper on the use of the Electric Telegraph in giving Notice of Storms." 14th March, 1857.

Col. Baron de Rottenburg, C.B.—"Extracts from a letter of Mr. Chalmers of Barrie, F.R.A.S., detailing some observations made on a Supposed Volcano in the Moon, on the 26th February, 1857." 14th March, 1857.

J. H. Morris, M.A.—"Notes of Travel in China." Part II. 21st March, 1857.

Prof. Wilson, LL.D.—"On Certain Homogeneous Characteristics ascribed Aboriginal Tribes of this Continent." 21st March, 1857.

John McNaughton, Esq.—"Remarks on the Relations of Canada to the ad Territories." 21st March, 1857.

Rev. A. C. Geikie.—"On Canadian English." 28th March, 1857.

Col. Baron de Rottenburg, C.B.—"On the Planetary Appearance of Stars 1st and 2nd Magnitudes, on the night of the 12th March, and the occultat Spica Virginis by the Moon on the morning of the 13th." 4th April, 1857.

G. D. Gibb, M.D.—"On Supposed Fossils found in Buckingham, England." April, 1857.

Prof. Cherriman, M.A.—"On Vision." 18th April, 1857.

J. Hirschfelder, Esq.—"Observations on Bedding out Plants." 18th April,

Prof. Chapman.—"On the occurrence of the genus Cryptoceras in Sil Rocks." 18th April, 1857.

It is believed that the papers enumerated in the above list will compare f ably with those of other years: more especially, as several have been de worthy of republication in some of the leading Scientific Journals of Europe is also gratifying to observe, with regard to these papers, that the appeal of ceding Councils for more active co-operation on the part of Members gene has been to a great extent responded to. The present Council venture, there to express a hope that a still more extended co-operation in this department, be anticipated in the session now about to commence.

Feeling strongly that the success of the Institute is dependent on, or at largely influenced by, the success of its Journal, the Council have great sati tion in alluding to the now fairly established and very marked success which accompanied the issue of the new series of the "Canadian Journal," under editorship of Dr. Wilson and a Committee appointed by the respec Councils of 1855 and 1856. The Council cannot allow this opportunity to without expressing an earnest desire that some special recognition on the par the Members of the Institute, be devised to mark their sense of the zealous valuable services of the chief editor. The following is the Report of the Edi Committee, to which the Council beg to direct especial attention:

REPORT OF THE EDITING COMMITTEE.

With the close of the second volume of the Canadian Journal (N. S.) Editing Committee beg to report to the Council, that they have continued du the past year to carry out the instructions originally drawn up for their guidar with such partial modifications as experience has suggested. The success of Journal has been such as they believe fully to confirm the opinion in which New Seriesginated, that the time had oricome for the maintenance in Canada of periodical specially devoted to original communications in Science and Literatu

From a desire to render the Journal more attractive, in some respects, to t general reader, the sum of £43 5s. has been expended during the past year illustrations but as, in its new form, it is regarded as still in some respects experiment, this increased outlay has been counterbalanced in part by economizin the accompanying letter-press. Still further, by the exercise of a careful ove sight in the preparation of M.SS. for the press, along with the exertions of thos Editors of Sections, who have mainly contributed the materials for the secon

volume now completed, and have continued their gratuitous services for the revision and correction of the press: the Committee have much satisfaction in reporting that the cost of the journal is very little in advance of the reduced expenditure of £257 stated in their former report. From the Treasurer's accounts it appears that the entire outlay incurred in issuing the Canadian Journal for 1857, including printing, illustrations, and the expenses of postage consequent on its distribution throughout the Province, and to foreign societies, &c., amounts to £263 0s. 5d.

In carrying out the resolution of the Council relative to the gratuitous distribution of the Journal among such societies and other learned bodies as it may appear desirable to maintain correspondence with, copies are now regularly sent to those specified in the following list, some of whom already transmit their printed proceedings and other publications of much greater value, in exchange. The Committee have to record their grateful acknowledgements to the Smithsonian Institution at Washington, for facilities afforded to them in the transmission of sets of the Journal to various European Societies and Institutions.

Imperial Library of France.
Geological Society of France.
Society of Antiquaries of France.
Royal Library of Copenhagen.
Society of Antiquaries of the North, Copenhagen.
Royal Library of Stockholm.
Library of the University of Christiania.
Smithsonian Institution, Washington.
Academy of Sciences, Philadelphia.
Historical Society of Philadelphia.
Franklin Institute, Philadelphia.
Natural History Society, Boston.
Lyceum of Natural History, New York.
Academy of Sciences, New Orleans.
Observatory, Cambridge, Massachusetts.
University Library, Michigan.
Royal Society of London.
Royal Society of Literature, London.
Royal Society of Arts, "
Royal Geographical Society, "
Royal Geological Society, "
Royal Astronomical Society, "
Society of Antiquaries of London.
Institute of British Architects.
Institute of Civil Engineers.
Archæological Institute.
British Archæological Association.
Ethnological Society of London.
Microscopical Society of London.
Chemical Society of London.
Royal Society of Edinburgh.
Royal Society of Arts, Edinburgh.

Royal Physical Society, Edinburgh.
Society of Antiquaries of Scotland.
Philosophical Society of Cambridge.
Society of Antiquaries of Newcastle-on-Tyne.
Royal Irish Academy.
Library of Trinity College, Dublin.
Natural History Society of Dublin.
Geological Society of Dublin.

In the second volume of the Canadian Journal, for 1857, twenty-three origin papers have been printed, twenty of which have been selected from those read the meetings of the Institute during the Session of 1856-57. The abstracts proceedings at the weekly meetings during the Session have also been continue and thus the Journal is made practically to embody *the Transactions of the Can dian Institute.* In addition to these, the department of literary and scientific views has been uninterruptedly maintained; and the Committee have great ple sure in recording their acknowledgements of valuable services rendered by Pr fessor Kingston, the Rev. Professor Young, and the Rev. Professor Hincks.

The section entitled SCIENTIFIC AND LITERARY NOTES continues to be maintain as a useful appendix for the dissemination of materials derived from Forei Journals and other published sources, as well as for original notes, abstracts, a reports of the proceedings of other Societies In this department, however, t Editing Committee would again earnestly urge on the members at large, the sirableness of their contributing the results of observations on subjects embrac in the various Sections. To several of these no single contribution has be offered during the past year; and in reference to that of Natural History especial the Committee deeply regret that members residing throughout the Provin should withhold reports of many observations and phenomena which must nec sarily come under their notice, and could not fail to be of general interest.

Neither long nor elaborate communications are desired for this departmen but brief notes, including reports of any remarkable astronomical or meteoro gical phenomena; notices of the appearance and disappearance of the migrat birds of our Northern latitudes; of the insects peculiar to different localities; a in general, of all that is novel or unrecorded relating to our Canadian fauna a flora. It is also highly desirable that reports of the discovery and contents Indian graves, with descriptions of such ancient relics and works of art as a brought to light, should be put on record. The section of geology and mineralog is another to which country members ought to be able to contribute notes whi would possess an interest to many, and might in some cases lead to the discove of new and important truths of great practical value. The Committee would on further add on this subject, that where members may be disinclined to communica notes on the above, or other subjects, they may further the objects in view b transmitting specimens of Natural History, Minerals, Indian relics, &c., to th Editors for the purpose of being noticed in the Journal. All objects so transmitte will be carefully preserved and returned.

In reference to the original papers which occupy the larger portion of the Journa the Committee are earnestly desirous of securing for this department such contr butions as shall reflect credit on the Province, now that the plan of circulatin the Journal among foreign Societies, is being successfully carried out; and the

trust that the success which has already rewarded their exertions—though far short of what they aim at,—may be regarded as sufficient to justify the hope of the Canadian Journal becoming a means of union and combined action among the Scientific and Literary Men of Canada, and a direct medium for the communication of such observations and discoveries to the scientific world, as have heretofore been published through the medium of English Societies' Transactions, or in foreign Scientific Journals.

In concluding this second report, the Editing Committee trust that it is unnecessary they should remind the Council, and the Members of the Society generally, that while they undertake the editing of the Journal, the contribution of materials for its pages is not only invited from the members at large, but is indispensable for its permanent success. The editorial oversight—including as it does, press-reading, correspondence, and the preparation of those portions of each number which necessarily constitute editorial work,—is in itself sufficient to involve a considerable sacrifice of time to those on whom it chiefly devolves. But in addition to this the supply of the requisite matter for each successive number has heretofore been the work of so small a minority of those who ought to constitute the working members of the Institute,—a body now numbering upwards of six hundred members throughout the Province,—as to encroach to an unfair extent on services voluntarily and freely rendered on behalf of the Society at large.

Toronto, 3rd December, 1857. DAN. WILSON, Convener.

With a view to add to the efficiency of the working staff of the Institute, the Council wish to recommend the adoption of the following changes relative to the election of Vice-presidents. They have come to the conclusion, after mature deliberation, that it is expedient to retain the services of the Vice-presidents for a longer time than that of a single year. Hence they propose that the first Vice-president shall retire annually, and his place be occupied by the second Vice-president; the third Vice-president becoming second; and that the new Vice-president who shall be elected to fill the vacancy shall rise successively to the rank of second and first Vice-president in subsequent years, before retiring from office. In this manner, it is thought, that a more thorough knowledge of the duties of the office and a greater interest in efficiently carrying out the same, will be acquired, than can reasonably be expected when, as at present, the tenure of office is limited to a single year. These proposed changes will be submitted to the Institute in proper form, for approval or rejection as the Members may think fit.

The financial prospects of the Institute are, on the whole, satisfactory. By the subjoined Report of the Treasurer, it will be seen that the estimated balance, after transferring a sum of £200 to the Building Fund, amounts to £343 3s. 7d.

TREASURER'S REPORT, 1857.

DR.] *Statement of Canadian Institute General Account for* 1857.

Estimated balance from last year..................	£211	6	6
Cash received from Members..........................	336	12	9
" " for sales of Journal..................	67	1	3
" " Parliamentary Grant..............	250	0	0

Cash received from Athenæum	£200	0	0	
Arrears due the Institute by Members............	316	1	3	
" " for sales of Journal..................	84	6	3	
				£1465 8

CR.]

Cash paid on account to publication of the Journal for 1856................	111	13	10	
" " " for 1857................	210	3	5	
" " " Library	98	0	5	
" " " Sundries	234	19	10	
" transferred to Building Fund................	200	0	0	
" due on account of Journal..................	52	17	0	
" " " Library..................	29	14	7	
" " " sundries	34	15	4	
Estimated deficiency in collecting subscriptions from Members, and for sale of Journal	150	0	0	
Estimated Balance in favour of Institute..........	343	3	7	
				£1465 8

Statement of Building Fund.

Balance from last year........................	£1269	5	9	
Cash transferred from General Account	200	0	0	
" received for Interest on Investments.........	99	4	1	
" due " " "	79	12	10	
" " on Subscription List (Building Fund)..	534	15	0	
				£2182 17

DR.] *The Treasurer in account with the Canadian Institute.*

Cash Balance from last year...	£ 91	5	7	
" " invested "	1389	6	8	
" received for Interest on Investments........	99	4	1	
" " from Athenæum..................	200	0	0	
" " Parliamentary Grant.............	250	0	0	
" " Members.........................	336	12	9	
" " for sales of Journal...............	67	1	3	
				£2433 10

CR.]

Cash paid on account to the publication of Journal for 1856	£111	13	10	
" " " " for 1857	210	3	5	
" " " " Library	98	0	5	
" " " " sundries..............	234	19	10	
" " " " invested	1600	0	0	
Balance in Bank of Upper Canada	178	12	10	
				£2433 10

December 1, 1857. D. CRAWFORD, *Treasurer.*

AUDITORS' REPORT, 1857.

The undersigned Auditors have to report that they have examined the Vouchers with the Cash-book and find them correct. Balance in the hands of the Treasurer One hundred and seventy-eight pounds twelve shillings and ten pence, and the sum of One thousand six hundred pounds invested on securities shewn to us.

T. W. BIRCHALL, } *Auditors.*
SAMUEL SPREULL, }

REPORT OF THE BUILDING COMMITTEE.

The Committee appointed to take steps for the erection of suitable buildings for the Canadian Institute, beg leave to report: That they have examined the working plans prepared by Messrs. Cumberland & Storm, in accordance with the resolution of the former Building Committee. Although highly approving of the general design and convenient arrangements of the contemplated buildings, they believe that the plans provide greater accommodation than will probably be required for several years, and that the cost of the erection would very much exceed the means at the disposal of the Institute. They endeavoured, therefore, to ascertain how far, without abandoning the hope of ultimately completing the whole, some portions of the design might for the present be altogether postponed, or only partially finished. They found, however, that even upon this supposition they could not hope to obtain a building which the Institute could occupy, under an outlay of £6,000, and that, even then, it would be in an unfinished state, and in many respects inconvenient in its arrangement, whilst the necessary alterations would very much increase the cost of completing the original design, if this should afterwards be found practicable.

The Committee have therefore been reluctantly compelled to abandon altogether the plan sanctioned by the former Building Committee, and to obtain a new design which, without exceeding the available means of the Institute, would afford liberal accommodation for present requirements, and be complete in itself whilst making provision for a possible extension hereafter.

Messrs. Cumberland & Storm had originally volunteered to prepare the plans and superintend the building gratuitously, but as the first design was entirely laid aside, the Committee, although fully appreciating the generosity of their offer, resolved that it would be more just to the architects, and would afford the Building Committee more complete control over the works, if Messrs. Cumberland & Storm were to be paid at the usual rate for their professional services connected with the new building.

Plans have therefore been prepared upon this understanding, and tenders have been advertised for, with the intention of submitting the plans and tenders at the same time to the Council for their sanction; but in the present financial difficulties it has been judged more prudent to postpone any action in the matter for another season.

JOHN LANGTON, Convener.

December, 1857.

In concluding this Report, the Council sincerely regret that the hope expressed at the close of the Report of last year with regard to the New Building, should be still unrealized. The delay in the prosecution of the work has not arisen from any supineness on the part of the Council; for, as will be seen by the above Report,

the Building Committee was re-organized during the past year, revised plans have been prepared, and much consideration has been bestowed upon the subject, both by the Committee and the Council. When, however, the requisite preliminaries had been so far matured as to encourage the anticipation of the work being immediately proceeded with, the expectations of the Council were once more disappointed, from difficulties connected with the financial aspect of the question, and the hopelessness of obtaining much additional assistance during a period of such uncertainty and commercial depression as that which now prevails. The Council trust, therefore, that in keeping the Institute free from embarassment, by postponing the work until another season, it will be conceded to them, that here, as in other cases during their term of office, they have acted for the best interests of the trust confided to their charge.

E. J. CHAPMAN,
Vice-President.

Toronto, 5th December, 1857.

The Report was unanimously adopted.

Prof. Hind, M.A., gave notice of motion,—Saturday, 9th January, 1858,—for an alteration of the Law having reference to the mode of holding the election of office-bearers.

The following resolution was moved by F. W. Cumberland, Esq., and seconded by G. P. Ure, Esq., and unanimously carried:

"That in compliance with the recommendation of the Council, and in cordial recognition of the valuable and zealous services rendered by Dr. Wilson, as chief editor of the 'Canadian Journal,' the sum of £120 be placed at the disposal of the Council for presentation to him, in such manner as, whilst expressive of the gratitude of the Institute, may be most acceptable to himself."

II. A ballot having been taken for officers of the Institute for the ensuing year,

The following Gentlemen were declared duly elected, viz.:

President, the Hon. Chief Justice Draper, C.B.	
1st Vice-President,	Col. Baron de Rottenburg, C.B.
2nd Vice-President,	John Langton, M.A.
3rd Vice-President,	Hon. W. B. Robinson.
Treasurer,	D. Crawford, Esq.
Recording Secretary,	Thos. Henning, Esq.
Corresponding do.	E. A. Meredith, LL.D.
Librarian,	Prof. H. Croft, D.C.L.
Curator,	Prof. H. Y. Hind, M.A.
Council,	Prof. D. Wilson, LL.D.
do	Prof. E. J. Chapman.
do	Rev. Prof. W. Hincks, F.L.S.
do	Prof. J. B. Cherriman, M.A.
do	Sandford Fleming, Esq., C.E.
do	J. George Hodgins, M.A.

The following resolution was moved by F. W. Cumberland, Esq., seconded by R. Spratt, Esq., and unanimously carried:

"That the most cordial thanks of the Institute be tendered to the Officers and Editing Committee of the past year, to whose efficient and zealous services is to be attributed the continued success of the Institute.

III. By order of the Council, the Royal Charter of the Institute was produced, and ordered to be printed in the proceedings of the meeting, for the information of the members at large:

ROYAL CHARTER OF INCORPORATION OF "THE CANADIAN INSTITUTE," GRANTED 4TH NOVEMBER, 1851.

PROVINCE OF CANADA.—ELGIN AND KINCARDINE.

VICTORIA by the Grace of God of the United Kingdom of Great Britain and Ireland, Queen, Defender of the Faith, &c. &c.

To al whom these presents shall come, greeting:

Whereas William E. Logan, John O. Browne, Frederick F. Passmore, Kivas Tully, William Thomas, Thomas Ridout, Sandford Fleming, and others of our loving subjects in our Province of Canada, have formed themselves into a Society for the encouragement and general advancement of the Physical Sciences, the Arts and the Manufactures, in this part of our Dominions; and more particularly for promoting the acquisition of those branches of Knowledge which are connected with the Professions of Surveying, Engineering, and Architecture: being the Arts of opening up the Wilderness and preparing the country for the pursuits of the Agriculturist, of adjusting with accuracy the boundaries of Properties, of improving and adorning our Cities and the habitations of our subjects, and otherwise smoothing the path of Civilization; and also being the Arts of directing the great sources of Power in Nature for the use and convenience of man, as the means of production and of traffic both for external and internal trade, and materially advancing the development of the Resources and of the Industrial Productions and Commerce of the Country; and have commenced the formation of a Museum for collections of Models and Drawings of Machines and Constructions, New Inventions and Improvements, Geological and Mineralogical Specimens, and whatever may be calculated, either as Natural Productions or Specimens of Art, to promote the purposes of Science and the general interests of society, and have subscribed and collected certain sums of money for these purposes.

And whereas, in order to secure the property of the said Society and to extend its useful operations and at the same time to give it a more permanent establishment among the Literary and Scientific Institutions of this part of our Dominions, we have been besought to grant to the said William E. Logan, John O. Browne, Frederick F. Passmore, Kivas Tully, William Thomas, Thomas Ridout, Sandford Fleming, and to those who now are or shall hereafter become members of the said Society, our Royal Charter of Incorporation, for the purpose aforesaid.

Now know ye that we, being desirous of encouraging a design so laudable and salutary, of our especial grace, certain knowledge, and mere motion, have willed, granted and declared, and do by these presents for us, our heirs and successors, will, grant and declare that the said William E. Logan, John O. Browne, Frederick Passmore, Kivas Tully, William Thomas, Thomas Ridout, Sandford Fleming, and such others of our loving subjects as now are members of the said Society, or shall at any time hereafter become members thereof according to such regulations or by-laws as shall be hereafter framed or enacted, shall by virtue of these presents be the members of, and form one body politic and corporate for the purposes aforesaid, by the name of "The Canadian Institute," by which name they shall have perpetual succession and a common seal, with full power and authority to alter,

vary, break, and renew the same at their discretion, and by the same name to sue and be sued, implead and be impleaded, answer and be answered unto, in every court, of us, our heirs and successors, and be forever capable in the law to purchase, receive, possess, and enjoy to them and their successors, any goods and chattels whatsoever, and also to be able and capable in law (notwithstanding the Statutes of Mortmain) to take, purchase, possess, hold and enjoy, to them and their successors, a Hall or House, and any Messuages, Lands, Tenements, or Hereditaments whatsoever, the yearly value of which, including the site of the said Hall, shall not exceed in the whole the sum of Two thousand pounds, computing the same respectively at the rack rent which might have been had or gotten for the same respectively at the time of the purchase or acquisition thereof, and to act in all the concerns of the said body politic and corporate for the purposes aforesaid as fully and effectually, to all intents, effects, constructions, and purposes whatsoever, as any other of our liege subjects or any other body politic or corporate in our said Province of Canada, not being under any disability, might do in their respective concerns.

And we do hereby grant our especial license and authority unto all and every person and persons, bodies politic and corporate, otherwise competent, to grant, sell, alien, and convey in Mortmain unto and to the use of the said Society and their successors any Messuages, Lands, Tenements, or Hereditaments not exceeding such annual value as aforesaid. And our will and pleasure is, and we further grant and declare, that there shall be a General Meeting of the Members of the said body politic and corporate, to be held from time to time as hereinafter mentioned, and that there shall always be a Council to direct and manage the concerns of the said body politic and corporate. and that the general meetings of the council shall have the entire direction and management of the same in the manner and subject to the regulations hereinafter mentioned. But our will and pleasure is, that at all General Meetings and Meetings of the Council, the majority of the members present, and having a right to vote thereat respectively, shall decide upon the matters propounded at such meetings. the person presiding therein having, in case of an equality of numbers, a second or casting vote.

And we do hereby also will, grant, and declare that the Council shall consist of a President, not more than three nor less than one Vice-President, and not more than eleven nor less than three other Members, to be elected out of the members of the said body politic and corporate, and that the first Members of the Council, exclusive of the President, shall be elected within six calendar months after the date of this our Charter, and that the said William E. Logan shall be the first President of the said body politic and corporate.

And we do hereby further will, grant and declare that it shall be lawful for the members of the said body politic and corporate hereby established to hold General Meetings once in the year or oftener, for the purposes hereinafter mentioned—viz, that the General Meeting shall choose the President, Vice Presidents, and other Members of the Council; that General Meetings shall make and establish such by-laws as they shall deem to be useful and necessary for the regulation of the said body politic and corporate, for the admission of members, the establishment of Branch Societies, the management of the estate, goods, and business of the said body politic and corporate, and for fixing and determining the manner of

electing the President, Vice-President, and other Members of the Council, and the period of their continuance in office, as also of electing and appointing a Treasurer, two Auditors, and two Secretaries, and such other officers, attendants, and servants, as shall be deemed necessary or useful for the said body politic and corporate, and such by-laws from time to time shall or may alter, vary or revoke, and shall and may make such new and other by-laws as they shall think most useful and expedient, so that the same be not repugnant to the laws of England, to these presents, or to the laws and statutes of this our Province of Canada, and shall and may also enter into any resolution and make any regulation respecting any of the affairs and concerns of the said body politic and corporate as shall be thought necessary and proper.

And we further will, grant and declare that the Council shall have the sole management of the income and funds of the said body politic and corporate, and also the entire management and superintendence of all the other affairs and concerns thereof, and shall and may—but not inconsistently with or contrary to the provisions of this our Charter or any existing by-law, the laws of England, or the laws and statutes of our said Province of Canada—do all such acts and deeds as shall appear to them necessary or essential to be done for the purpose of carrying into effect the objects and views of the said body politic and corporate.

And we further will, grant and declare that the whole property of the said body politic and corporate shall be vested, and we do hereby vest the same, solely and absolutely in the members thereof, and that they shall have full power and authority to sell, alienate, charge or otherwise dispose of the same as they shall think proper; but that no sale, mortgage, incumbrance, or other disposition of any Messuages, Lands, Tenements, or Hereditaments belonging to the said body politic and corporate shall be made, except with the approbation and concurrence of a General Meeting.

And we lastly declare it to be our royal will and pleasure that no resolution or by-law shall on any account or pretence whatsoever be made by the said body politic and corporate in opposition to the general scope, true intent and meaning of this our Charter, the laws of England, or the laws and statutes of this our said Province of Canada, and that if any such rule or by-law shall be made, the same shall be absolutely null and void to all intents, effects, constructions and purposes whatsoever.

In testimony whereof we have caused these our Letters to be made Patent, and the Great Seal of our said Province to be hereunto affixed.

Witness our Right Trusty and Right Well-beloved Cousin James, Earl of Elgin and Kincardine, Knight of the Most Ancient and Most Noble Order of the Thistle, Governor General of British North America, and Captain General and Governor-in-Chief in and over our Provinces of Canada, Nova Scotia, New Brunswick, and the Island of Prince Edward, and Vice Admiral of the same, &c. &c., at Quebec, this fourth day of November, in the year of Our Lord One Thousand Eight Hundred and Fifty one, and in the fifteenth year of our reign.

W. B. Richards,
Attorney General.

By Command,
E. A. Meredith,
Assistant Secretary.

IV. *The following Papers were read:*

1. By Professor Cherriman, M.A.:
"Note on the propositions of Pythagoras and Pappus."
2. By Professor Kingston, M.A.:
"On deducing the mean temperature of a month from the daily indicati self-registering Thermometers."

THIRD ORDINARY MEETING.—*9th January*, 1858.

The Hon. Chief Justice DRAPER, C.B., President, in the Chair.

I. *The following Gentlemen were elected Members:*

W. H. GRIFFIN, Esq., Toronto.
T. BRIGHTON, Esq., Toronto.
JAMES AUSTIN DICKINSON, Esq., Toronto.
W. RADENHURST, Esq., Toronto (Junior Member.)

II. Dr. Wilson acknowledged the receipt of a service of silver Plate the members of the Institute, presented to him in accordance with the mous resolution of the last General Meeting, and returned thanks for the sa

III. *The following donations to the Library and Museum were announced, a thanks of the Institute voted to the donors:*

1. From the Hon. East India Company:
Bombay Magnetical and Meteorological Observations. 1854 and 1855.
2. From the Chief Superintendent of Education, Upper Canada:
Annual Report of the Normal and Common Schools in Upper Canada for
3. From the Hon. J. M. Brodhead, Washington:
Patent Office Reports, 1856.
Mechanics. Vols. I. II. and III.
Agriculture. Vol. I.
Report of the Commercial relations of the United States with all F Nations. Vol. IV.
4. From J. F. Smith, Esq.:
A specimen of the Atlantic Telegraph Cable.

IV. The ANNUAL ADDRESS was delivered by the President, the Hon. Justice Draper, C.B.

The following resolution was moved by the Rev. Dr. McCaul, seconded b Baron de Rottenburg, C.B., and carried by acclamation:

"That the special thanks of the Institute be given to the President f able Address, and that a copy be requested for publication in the Journal."

V. *The following Papers were read:*

1. By Professor Croft, D.C.L.:
"On the oxidation of Arsenious Acid."
2. By F. Assiekinack, Esq.:
"On the Legends and Traditions of the Odahwah Indians."
3. By Professor Kingston, M.A.:
"Report of the Meteorological Committee of the Council."

FOURTH ORDINARY MEETING—16*th January*, 1858.

The Hon. Chief Justice DRAPER, C.B., President, in the Chair.

I. *The following Gentlemen were elected Members:*

WILLIAM ANNIS, Esq., Toronto.
HENRY J. CAMBIE, Esq., M.A., Toronto.

II. *The following donations for the Museum were announced, and the thanks of the Institute voted to the donor:*

By J. F. Smith, Esq.:

Eighteen specimens of Shells and Fossils from the Chalk of Kent and Sussex, England.

III. Prof. Hind's notice of motion respecting the proposed alteration in the laws was taken up, when, in the absence of Prof. Hind, Prof. Wilson moved, seconded by A. E. Meredith, LL.D.: that in Rule 4th, Section IV, the following be substituted for the last clause, beginning "votes of country members," &c. "A printed list of members nominated for election as office-bearers, shall be forwarded by Post to country members, but no list shall be received by the Scrutineers, unless presented personally by the member desiring to vote."

After discussion of the question, Dr. Wilson withdrew his motion, in favor of the following motion, by E. W. Cumberland, Esq., seconded by P. Freeland, Esq., which was adopted:

"That the Constitution and Laws, so far as they refer to nomination and election of officers, be remitted to the Council for report of such alterations as they may deem expedient.

IV. *The following Papers were read:*

1. By Professor Chapman:

"On the assaying of Coals by the blow-pipe, with remarks on blow-pipe examinations in general."

2. By the Rev. Professor Hincks, F.L.S.:

"Notes respecting a collection of Mazatlan Shells recently acquired by the University of Toronto."

FIFTH ORDINARY MEETING—23*rd January*, 1858.

The Hon. Chief Justice DRAPER, C.B., President, in the Chair.

I. *The following Gentlemen were elected members:*

Major R. LACHLAN, Cincinnati, Ohio, Cor. member.
EDWARD C. JONES, Esq., Toronto.
A. B. SCOTT, Esq., Toronto.
MATHEW LOGAN, Esq., Toronto.
WALTER BEATY, Esq., Toronto.
Rev. J. G. ALRAHALL, M.A., Toronto.
CHARLES A. JONES, Esq., Weston. } Junior members.
A. CLIFFORD THOMPSON, Esq., Toronto. }

II. *The following Papers were read:*

1. By Professor Wilson, LL.D.:

"Note on the American Cranial Type."

2. By Professor Kingston, M.A.:

"The Annual Meteorological Report."

3. By F. Assikinack, Esq.:

"On the manners and customs of the Odahwah Indians."

MEAN METEOROLOGICAL RESULTS AT TORONTO FOR THE YEAR 1857. *Read before the Canadian Institute 23rd January, 1858.*

BY PROFESSOR KINGSTON, M.A., DIRECTOR OF THE PROVINCIAL MAGNETIC OBSERVATORY, TORONTO.

The mean temperature of the year 1857 was 42°.73, being 1°.34 below the average of 18 years, but 0°.57 above that of the preceding year. The mean temperatures of the several months were in seven instances below and in five above the averages for the respective months, the average depression to the average elevation being moreover in the ratio of 4 to 2.5. January was the coldest January and February was the warmest February on record, and the thermic deviation from their respective averages, but in contrary directions, was so great as to occasion an inversion in the difference between their temperature; for whereas February is on the average 0°.24 colder than January it was in this instance by 5°.78 the warmer of the two.

Another example somewhat similar but not amounting to an inversion occurred at the close of the year. November, which, on the average is more than 9° warmer than December was but 1°.7 warmer in 1857. January was further remarkable for exhibiting the lowest absolute temperature —20°1 that ever occurred in January, and February was also remarkable for the highest temperature 52°.4 that ever occurred in February. The minimum of November —3°.5 was more than 10° lower than any temperature that occurred before in that month. January was moreover not only the coldest January on record and the coldest month of 1857, but it was absolutely the coldest month ever recorded.

The highest absolute temperature was 86°.6 in August, and the lowest —20°1 in January.

There were 71 instances in which the temperature at the hour of observation was depressed 20° below the normal for that hour, 17 instances only when there was an equal deviation in excess.

BAROMETER.—The highest reading of the barometer was 30.361 inches, and occurred at 9 p. m. on 10th February, and the lowest 28.452 inches which was the lowest ever recorded, occurred at 10 a. m. on 19th November. There were 43 instances in which the reading of the barometer exceeded the average, and 54 when it fell short of the average to the extent of half an inch. The greatest deviation in excess was 0.745 at midnight on 10th February, and the greatest deviation in defect was 1.110 at 8 a. m. 19th November.

The greatest barometric range within 24 hours with a rising column was .918 on 8th February, and the greatest with a falling column was .715 on 26th February.

HUMIDITY.—The mean humidity of the year was 79, the greatest monthly humidity being in January, and the least in April and May. There were 15 instances of complete saturation, of which 7 occurred in January, 4 in February, 2 in March, and 2 in December. The days of the greatest humidity were 22nd January and 5th February, on both of which the mean humidity of the day amounted to 98. The least humidity at the time of observation was .31 on the 4th March, and the two driest days were 30th March with a mean humidity .54, and 21st May with a mean humidity .55.

CLOUDS.—The extent of sky clouded was on the average of the year three-fifths of the whole, and for nine months the sky was on the average more than half overcast. December was the most cloudy month, and September the month most free from clouds. The most cloudy hours on the average were [illegible]

WIND.—The resultant direction of the wind it will be seen from the table was rather more from the north then usual, and both the resultant velocity and the mean velocity were less than in the preceding year. The most windy day was 24th October when the velocity was 27.08 miles per hour. The most windy hour absolutely was 6 a. m. to 7 a. m. on 10th February, when the velocity was 44.6 miles per hour. The most windy hour on the average of the year was from noon to 1 p. m. with an average velocity of 10.63 miles per hour, and the least windy hour from 5 to 6 a. m. with an average velocity of 6.36 miles per hour.

RAIN AND SNOW.—The depth of rain, 33.205 inches, was considerably in excess of that of late years, but the total depth of rain and melted snow, though amounting to 40.585, inches fell short by about one inch of that of 1855, when the quantity of snow was extraordinarily great. August was the most rainy month, considered, with reference to the *quantity* of rain, and June with reference to the *number of rainy days*. January, both as regards the quantity of rain and the number of rainy days was the least rainy month, but if snow be reckoned as well as rain January will rank next to August with respect to the *amount*, and next to June with respect to the *number of days* of precipitation. The most rainy day was 15th February, when the depth amounted to 1.620 inches, and the heaviest fall of snow was on 10th January with a depth of 5.5 inches.

Rain fell on 134 days and snow on 79 days, including some of the days already enumerated as days of rain; and there were but 171 days when neither rain or snow fell, a number of fair days, less by 27, than those of either of the three preceding years. The rain occupied 613.3 hours, and the snow 322.5 hours in its fall, giving a total of 935.8 hours, or upwards of 33 days when rain or snow was actually falling. The hour when rain was most prevalent through the year was from 3 p. m. to 4 p. m., similarly the most snowy hour was from 5 p. m. to 6 p. m., and the hour most subject to rain or snow was from 2 p. m. to 3 p. m. The hours most free from rain and snow considered separately were from 5 a. m. to 6 a. m. for rain, and 1 a. m. to 2 a. m. for snow; and the hour most free from rain or snow collectively was from midnight to 1 a. m.

THUNDERSTORMS.—Of the 28 thunderstorms enumerated in the table there were but few remarkable for violence. There were besides 19 days when lightning occurred without thunder or hail, 3 days of thunder without lightning or hail, and 6 days when hail fell unaccompanied by either thunder or lightning.

AURORAS.—The nights favorable for observing auroras and the number of auroras observed were both considerably less than in the preceding three years, but the auroras that were observed on the nights of 7th May and 17th November were far more brilliant than any recorded during the same period.

From the 10th to the 13th August the periodic meteors were numerous, and some of considerable brilliancy; in November there was a remarkable absence of these bodies.

Toronto Bay was clear of ice on the 17th April. [illegible]

The following table exhibits the general Meteorological Register, for the year 1857, deduced from the observations taken at the Provincial Observatory, Toronto :

	Jany.	Feby.	March	April.	May.	June.	July.	Augst.	Sept.	Octr.	Novr.	Decr.	Year 1857.	Year. 1856.	Year 1855.	Year 1854.	Year 1853.
Mean Temperature..................	° 12.75	° 28.53	° 27.82	° 35.36	° 48.87	° 56.92	° 67.76	° 65.31	° 58.64	° 45.42	° 33.54	° 31.86	° 42.78	° 42.16	° 43.98	° 45.21	° 44.78
Difference from average(18y's.)	−10.47	+ 5.55	− 2.00	− 5.70	− 2.44	− 4.24	+ 0.73	− 0.71	+ 0.57	+ 0.22	− 3.08	+ 5.51	− 1.34	− 1.99	− 0.29	+ 0.87	+ 0.44
Ther. Anomaly (Lat. 43° 40′ N.)	−20.05	− 6.17	−13.28	−14.84	− 9.23	− 7.68	− 0.94	− 3.19	− 2.86	− 8.38	− 9.66	− 4.14	− 8.27	− 8.84	− 7.02	− 5.79	− 6.22
Highest Temperature..............	37.2	52.4	57.6	52.0	74.8	76.0	86.6	88.2	82.0	64.0	58.2	46.0	88.2	96.6	92.8	99.2	94.9
Lowest Temperature	−20.1	− 5.9	− 5.5	5.9	26.0	35.0	47.0	46.0	34.1	26.5	− 3.5	4.7	−20.1	−18.7	−25.4	−10.8	− 9.7
Monthly and Annual Ranges...	57.3	58.3	63.1	46.1	48.8	41.0	39.6	42.2	47.9	37.5	61.7	41.3	108.3	115.3	118.2	110.0	104.6
Mean Maximum Temperature.	19.46	35.66	35.25	43.36	57.17	65.48	76.79	74.45	67.48	51.93	39.94	35.75	......	......	......	......	......
Mean Minimun Temperature..	0.85	20.42	17.79	27.24	40.24	48.99	59.32	54.95	48.14	37.47	26.55	24.20	......	......	......	......	......
Mean Daily Range	18.61	15.25	17.46	16.12	16.94	16.49	17.47	19.50	19.34	14.45	13.39	11.55	......	......	......	......	......
Greatest Daily Range	35.0	32.0	37.0	32.5	26.8	24.4	24.8	28.0	28.5	26.2	27.0	29.8	37.0	44.2	39.4	44.5	40.9
Mean Height of Barometer	29.7362	29.7361	29.5957	29.5300	29.5353	29.4267	29.5881	29.5943	29.7120	29.6671	29.5238	26.6188	28.6054	29.5999	29.6244	29.6077	29.6299
Difference from average(12y's.)	+.1064	+.1236	−.0357	−.0771	−.0462	−.1551	−.0090	−.0418	+.0579	+.0273	−.0950	−.0275	−.0145	−.0200	+.0050	−.0122	+.0100
Highest Barometer	30.168	30.361	30.006	30.006	29.896	29.707	29.848	29.860	30.076	29.994	30.281	30.258	30.361	30.480	30.552	30.245	30.315
Lowest Barometer	29.181	29.152	29.115	28.898	29.199	28.952	29.255	29.155	29.248	29.289	28.452	28.852	28.452	20.459	28.459	28.685	28.653
Monthly and Annual Ranges...	0.987	1.209	0.891	1.108	0.697	0.755	0.593	0.705	0.828	0.705	1.829	1.406	1.909	2.021	2.093	1.560	1.662
Mean Humidity	.89	.84	.77	.74	.74	.77	.78	.77	.78	.78	.77	.80	.79	.75	.77	.79	.79
Mean Elas'ty. of Aqueous Vapor	.083	.147	.124	.156	.254	.353	.520	.467	.393	.243	.157	.149	0.254	0.244	0.263	0.279	.271
Mean of Cloudiness	0.68	0.79	0.61	0.54	0.61	0.69	0.46	0.47	0.43	0.62	0.67	0.73	0.60	0.57	0.60	0.59	0.57
Resultant Direction of Wind...	N 70 W	S 78 W	N 63 W	N 60 W	N 23 W	N 49 W	S 68 E	N 77 W	N 68 W	N 19 W	S 61 W	N 89 W	N 74 W	N 71 W	N 62 W	N 43 W	N 38 W
" Velocity of Wind............	4.96	3.68	6.63	4.15	1.14	1.15	0.81	1.51	1.61	2.98	5.45	2.51	2.54	3.03	2.51	1.37	1.17
Mean " " (miles per h.)	10 31	9.82	10.84	10.24	8.13	7.60	4.74	6.36	5.55	6.24	9.25	6 84	7.99	8.31	8.18	6.02	5.08
Difference from average (10 y's.)	+2.75	+2.21	+3.01	+3.17	+2.00	+2.87	+0.19	+1.36	+0.23	+0.74	+2.45	−0.80	+1.68	+2.19	+2.33	+0.53	−0.33
Total Amount of Rain (inches).	Inapp.	3.054	0.335	1.755	4.145	5.060	3.475	5.265	2.640	1.040	3.235	3.205	33.205	21.505	31.650	27.707	23.550
Difference from avg. (17-18y's.)	−1.501	+1.911	−1.108	−0.783	+1.016	+1.897	−0.087	+2.458	−1.693	−1.657	+0.294	+1.568	+2.223	−9.321	+0.286	−3.570	−8.076
Number of Days Rain...........	3	11	4	10	15	21	15	13	11	10	14	7	134	98	103	114	109
Total Amount of Snow (inches)	21.8	11.7	11.3	12.9	Inapp.	......	......	......	......	0.2	6.9	9.0	73.8	65.5	99.0	49.5	53.2
Difference from average(15y's.)	+ 7.85	− 5.57	+ 0.90	+10.29	− 0.08	......	......	......	......	−0.86	+3.63	−5.03	+11.1	+ 3.6	+37.4	− 8.9	− 6.1
Number of Days Snow	16	11	15	11	1	......	......	......	......	2	9	14	79	69	64	52	52
Number of Fair Days...............	14	10	15	15	15	9	16	18	19	19	9	12	171	198	198	199	204
Number of Auroras observed ..	0	1	2	1	3	1	5	1	6	2	2	2	26	36	46	52	57
Possible to see " (No. Nights)	12	12	13	17	17	14	22	23	21	13	14	12	189	212	204	203	233
Number of Thunderstorms......	0	1	1	1	2	7	7	6	2	0	1	0	28	25	36	58	34

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST—DECEMBER, 1857.

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 min. 33 sec. West. Elevation above Lake Ontario, 108 feet.

Day	Barom. at temp. of 32°. 6 A.M.	2 P.M.	10 P.M.	MEAN	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	ME'N	Mean Temp. + or — of the Average	Tens. of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Resultant Direction.	Velocity of Wind. 6 A.M.	2 P.M.	10 P.M.	Result.	ME'N	Rain in Inches.	Snow in Inches.
					°	°	°	°	°												°							
1	29.670	29.733	29.751	29.7287	37.5	38.6	34.2	36.35	+ 5.57	.180	.175	.152	.168	.80	.75	.76	.78	W S W	S W	Calm.	S 52 W	11.6	10.2	0.0	3.65	3.68	......	...
2	.700	.482	.541	.5720	33.4	40.7	37.3	37.55	+ 7.07	.159	.191	160	.167	.83	.75	.72	.74	Calm.	S	W b S	S 64 W	0.0	8.4	12.8	7.68	9.13	......	...
3	.688	.759	.824	.7663	31.4	32.3	27.7	30.40	+ 0.32	.107	.138	.120	.116	.60	.76	.78	.68	W b S	W	W b N	N 85 W	14.6	19.2	5.3	12.14	12.29	......	Inap
4	.869	.830	.688	.7845	24.9	31.5	31.9	29.47	— 0.32	.111	.109	.135	.121	.81	.61	.75	.74	Calm.	W b N	S E	S 76 E	0.0	3.2	4.5	0.64	4 76	......	0.4
5	.642	.725	.711	.6963	28.1	29.6	30.3	28.95	— 0.42	.141	.139	.132	.134	.90	.84	.78	.83	N E b E	E b N	E b N	N 77 E	9.0	9.8	15.5	12.23	12.39	......	0.5
6	.483	.175	—	—	34.2	39.4	—	—	—	.183	.202	—	—	.67	.84	—	—	E	E	E S E	S 78 E	18.5	11.5	1.5	3.79	7.99	0.325	...
7	.529	.643	.644	.6110	35.7	48.6	35.0	37.22	+ 8.55	.162	.193	.194	.178	.78	.71	.95	.81	W S W	S W b S	Calm.	S 61 W	10.5	9.5	0.0	3.13	4.15	0.165	...
8	.579	.707	.734	.6768	37.2	45.6	36.8	39.75	+11.28	.203	.200	.155	.180	.92	.66	.71	.75	N	N N W	N	N 79 E	0.2	4.5	6.0	2.97	7.00	0.190	...
9	.410	.166	.235	.2665	38.8	42.6	41.1	40.37	+12.22	.220	.250	.203	220	.94	.93	.79	.88	S E	N E	W b N	S 63 W	19.5	3.6	8.4	1.63	11.65	1.055	...
10	.370	.366	.676	.4892	35.3	35.5	26.6	32.48	+ 4.63	.147	.148	.115	.135	.71	.71	79	.72	S W b W	W b S	N W b W	S 88 W	13 8	12.7	12.5	11.81	13.16	......	1.5
11	.870	.958	30.159	30.0135	21.6	29.9	20.5	23.92	— 3.73	.089	.123	.100	.103	.74	.74	.58	.78	N W b W	N b W	N W b W	N 25 W	0.8	1.8	0.6	1.97	2.17	......	...
12	30.222	30.206	30.126	30.1795	15.1	29.7	24.3	23.33	— 4.02	.086	.126	.111	.107	.93	.77	.83	.83	N W b W	S W b S	W S W	S 74 W	0.5	1.0	1.9	1.74	1.92	......	...
13	30.050	29.893	—	—	25.6	38.3	—	—	—	.128	.179	—	—	.90	.78	—	—	S W b W	S W b S	S W b W	S 45 W	4.5	9.8	13.0	9.32	9.56	......	...
14	29.753	29.753	29.874	29.7992	35.3	43.9	36.8	37.68	+10.72	.183	.210	.185	.181	.89	.74	.85	.81	W S W	S W	N	S 72 W	2.4	1.0	1.0	1.44	2.18	......	...
15	.940	.919	.879	.9132	35.7	38.2	37.1	36.85	+10.08	.167	.194	.206	.191	.81	.85	.95	.88	N b W	E	E N E	N 77 E	0 8	9.5	0.2	3.02	3.25	......	...
16	.858	.841	.812	.8385	32.8	37.1	31.7	33.87	+ 7.30	.178	.207	.169	.183	.96	.95	.95	.95	Calm.	N E b E	Calm.	N 56 E	0.0	0.2	0.0	0.12	0.13	......	...
17	.758	.638	.483	.6083	31.3	36.1	36.8	35.15	+ 8.78	.166	.197	.200	.191	.95	.95	.92	.94	Calm.	Calm.	N N E	N 61 E	0.0	0.0	3.0	5.19	5.36	0.530	...
18	.170	.142	.552	.3075	38.6	37.3	30.6	35.60	+ 9.48	.215	.199	.129	.182	.93	.90	.75	.86	E N E	W b N	N W b W	N 54 W	17.6	10.9	27.0	13.12	17.42	0.405	Inap
19	.820	.936	30.006	9377	27.0	26.7	23.0	24.97	— 1.10	.100	.093	.112	.104	.67	.63	.87	.76	N W b W	N W b W	N W b N	N 52 W	16.0	10.0	8.3	7.63	7.70	......	Inap
20	30.068	30.074	—	—	25.7	29.7	—	—	—	.111	.121	—	—	.78	.73	—	—	N W	S S W	S S W	S 36 W	0.6	2.3	0.8	1.44	1.56	......	...
21	29.960	29.764	29.449	.6942	26.3	36.0	32.8	31.03	+ 5.25	.114	.157	.173	.146	.80	.74	.93	.83	S S W	E b N	N E	N 46 E	0.2	4.8	2.8	2.24	2.93	......	3.5
22	.228	.296	.342	.2935	32.1	34.6	29.2	31.43	+ 5.75	.158	.157	.117	.143	.88	.77	.72	.80	N N W	N W b W	W	N 76 W	7 8	9.0	15.0	10.03	11.76	......	0.5
23	.253	.060	.140	.1547	23.8	30.3	32.8	29.07	+ 3.50	.093	.120	.128	.118	.70	.70	.68	.72	S W b W	W S W	W b S	S 74 W	14.8	19.5	15.0	15.69	16.52	......	...
24	.459	.724	.801	.6733	29.9	24.3	11.9	22.92	— 2.57	.118	.075	.069	.091	.70	.55	.86	.71	W b N	W N W	Calm.	N 58 W	22.2	15.5	0 0	6.55	6.96	......	...
25	.713	.613	—	—	19.0	18.8	—	—	—	.097	.096	—	—	.91	.91	—	—	N N W	N N E	N E b E	N 82 E	0.5	4.0	4.0	2.24	3.57	......	0.8
26	.406	.493	.699	.5503	19.8	21.9	21.8	20.47	— 4.83	.079	.088	.084	.085	.71	.72	.70	.75	N E b N	N b E	N W b W	N 8 W	6.0	4.4	14.5	4.14	5.29	......	0.5
27	.844	.759	—	—	5.7	24.3	—	—	—	.047	.104	—	—	.78	.78	—	—	Calm.	S b E	S S W	S 17 W	0.0	10.4	19.5	9.35	11.54	......	Inap
28	.433	.556	680	.5667	34.1	38.3	29.5	33.12	+ 7.97	.184	.153	.128	.150	.95	.66	.78	.79	S W b S	W b S	Calm.	S 58 W	9.5	2.2	0.0	2.34	2.46	......	...
29	.630	.625	.636	.6322	23.8	34.6	26.5	28.25	+ 3.08	.118	.156	.110	.125	.90	.76	.76	.79	N W	N b W	N	N 18 E	1.0	3.3	4.0	2.52	3.28	......	0.3
30	.446	.246	.115	.2480	33.0	36.4	37.1	35.50	+10.33	.163	.204	.207	197	.87	.95	.96	.96	E N E	Calm.	Calm.	S 59 E	3.9	0.0	0.0	0.44	0.51	0.535	0.5
31	28.852	.001	.329	.0680	33.2	34.8	30.3	32.57	+ 7.38	.183	.154	.132	.156	.97	.75	.78	.84	S W b W	W b S	S W b W	S 74 W	3.5	15.0	7.0	8.94	9.70	......	0.5
M	29.5070	29.5988	29.6405	29.6188	30.60	34.97	30.52	31.86	+ 4.77	.147	.160	.143	.140	.83	.76	.82	.80	......	...		......	[illegible]	7.33	[illegible]		[illegible]	[illegible]	9.0

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR DECEMBER, 1857.

Highest Barometer . . . . 30.258 at 11 a.m. on 12th } Monthly range=
Lowest Barometer. . . . . 28.852 at 6 a.m. on 31st } 1.406 inches.

Self-register-ing Ther. { Maximum temperature . . . . 46°0 on p. m. of 8th } Monthly range= 41°3
Minimum temperature . . . . 4.7 on a. m. of 27th }
Mean maximum temperature . . 35°75 } Mean daily range = 11°55
Mean minimum temperature . . 24°20 }
Greatest daily range . . . . 29°8 from a. m. of 27th to a. m. of 28th.
Least daily range . . . . 3.5 from a. m. of 25th to a. m. of 26th.

Warmest day . . 9th ... Mean Temperature . . . 40°37 } Difference=19°90.
Coldest day. . . . 26th ... Mean Temperature . . . 20°47 }

Maximum { Solar . . . . 65°5 on p. m. of 8th } Monthly range=
Radiation { Terrestrial . . . . —2.5 on a. m. of 27th } 68°0

Aurora observed on 2 nights, viz.: 20th and 22nd; possible to see Aurora on 12 night; impossible on 19 nights.

Snowing on 14 days; depth, 9.0 inches; duration of fall 52.2 hours.
Raining on 7 days; depth, 3.205 inches; duration of fall, 64.2 hours.

Mean of cloudiness=0.73; most cloudy hour observed, 8 a. m., mean=0.78: least cloudy hour observed, 10 p. m.; mean=0.67.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
1183.67	1158.16	1103.82	2986.64

Resultant direction of the wind, N 89° W; Resultant Velocity, 2.51 miles per hour.

Mean velocity of the wind 6.84 miles per hour.
Maximum velocity . . . 31.8 miles per hour, from 8 to 9 p. m. on 18th.

Most windy day . . . . 18th—Mean velocity, 17.42 miles per hour.
Least windy day . . . . 16th—Mean velocity, 0.13 do

Most windy hour, noon, to 1 p.m.—Mean velocity, 8.79 do } Difference
Least windy hour, 5 to 6 p.m.—Mean velocity, 5.79 do } 3.00 miles.

6th—Very dense Fog at 9 p.m.
12th—Corona round Jupiter at 10 p.m.
16th—Dense Fog during the whole day.
17th—Dense Fog till 10 p.m.
22nd—Solar Halo, 9.45 p.m. Upper portion very distinct.
27th—Very perfect Lunar Halo at 7 p.m.
28th—Very perfect Lunar Halo from 10 p.m.
29th—Perfect Lunar Halo from 8.40 to 11 p.m.

Temperature—The mean temperature of December was 5°51 above the average of 18 years. It was once equalled (in Dec., 1852), but never exceeded in that period.

Rain—The depth of rain was 1.568 inches above the average of 17 years.

Snow—The depth of snow was 5.03 inches less than the average of 15 years.

Wind—The mean velocity of the wind was 0.80 miles per hour less than the average of 10 years. The resultant Direction and Velocity, from 1848 to 1857 inclusive, were N 76° W. 2,86 miles per hour.

Comparatively, the mouth has been warm, rainy, cloudy, and calm.

COMPARATIVE TABLE FOR DECEMBER.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Difference from Average.	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant Direction.	Resultant Velocity.	Mean Velocity
1840	24°.3	—2°.0	41°.0	—4°.4	45°.4	8	.	18	...	...	...	...
1841	28.7	+ 2.4	45.5	+ 2.4	43.1	7	6.600	.	...	...	...	1.33lbs
1842	24.7	— 1.6	40.3	+ 3.8	36.5	8	0.880	17	...	...	...	0.61 "
1843	30.0	+ 3.7	41.1	+ 2.7	38.4	6	1.040	8	8.1	...	...	0 53 "
1844	28.2	+ 1.9	48.9	— 0.8	49.7	6	Imp.	6	4.2	...	...	0.40 "
1845	21.1	— 5.2	37.6	— 2.7	40 3	2	Inap.	12	4.7	...	...	0.70 "
1846	27.5	+ 1.2	49.2	+ 3.7	45.5	5	1.213	9	6.0	...	...	0.57 "
1847	30.1	+ 3.8	50.0	+ 6.6	43.4	7	1.185	8	6.8	...	...	0.35 "
1848	29.1	+ 2.8	49.1	+ 0.6	48.5	7	2.750	7	16.5	S 83 W	1.12	5.44ms.
1849	26.5	+ 0 2	41.3	— 5.2	46.5	5	0.840	19	9.6	N 82 W	2.56	6.23 "
1850	21.7	— 4.6	48.3	— 9.7	58.0	2	0.190	18	29.5	N 44 W	2.93	7.40 "
1851	21.5	— 4.8	43.8	—10.5	54.3	6	1.075	15	10.7	N 82 W	4.00	7.37 "
1852	31.9	+ 5.6	51.0	+18.9	37.1	7	3.995	10	20.1	S 69 W	1.03	6.54 "
1853	25.3	— 1.0	42.2	— 5.2	47.4	4	0.625	13	22.3	N 38 W	2.41	4.98 "
1854	21.9	— 4.4	41.8	— 5.9	47.7	5	0.590	12	17.2	N 47 W	4.18	8.66 "
1855	26.8	+ 0.5	45.9	— 2.1	48.0	6	1.845	10	29.5	S 88 W	5.29	11.38 "
1856	[illegible]	— 3.4	41.2	— 9.1	50.3	6	1.790	20	16.3	S 87 W	4.62	11.56 "
1857	[illegible]1.9	+ 5.6	45.6	+ 5.7	39.9	7	3.205	14	9.0	N 89 W	2.51	6.84 "
Mean	26.3	...	44.65	—0.90	45.55	5.2	1.637	11.9	14.03	...	...	7.64

MONTHLY METEOROLOGICAL REGISTER AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—JANUARY, 1858.

Latitude—43 deg. 39.4 min. North. Longitude—5h. 17m. 33s. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Mean Temp. + or — of the Average	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resul't. Direction.	Direction of Wind.					Rain in inches.	Snow in inches.
	6 A.M.	2 P.M.	10 P.M.	Mean.	6 A.M	2 P.M	10 PM	ME'N		6 A.M	2 P.M	10 P.M.	M'N	6 A.M	2 P.M.	10 P.M.	M'N	6 A. M.	2 P. M	10 P. M.		6 A.M.	2 P.M.	10 P.M.	Re-sult'.	ME'N		
1	29.244	29.529	29.816	29.5352	°33.2	°35.0	°22.0	°29.48	° + 4.27	.151	.134	.098	.125	.80	.67	.86	.77	S b E	W b N	Calm.	N °81 W	3.0	12.4	0.0	4.40	5.47	...	0.1
2	.777	.635	.674	.6937	26.6	35.3	23.6	27.77	+ 2.57	126	101	092	105	87	48	72	71	S W b S	S W b W	W	S 64 W	7.8	14.0	1.0	7.11	7.27	...	...
3	.605	.221	—	—	22.5	38.2	—	—	—	102	110	—	—	86	47	—	—	S W b W	W S W	S W b W	S 53 W	5.1	19.0	6.0	13.66	13.96	...	...
4	.174	.105	.283	.1992	37.1	44.2	40.4	40.18	+15.05	148	143	227	170	67	49	90	68	S W b S	S W	W b S	S 50 W	18.0	12.0	2.5	7.08	7.17	...	...
5	.456	.492	.507	.4933	32.8	34.8	25.9	29.97	+ 4.83	163	133	120	128	87	66	86	78	W b N	N	E b N	N 52 E	0.2	6.2	14.0	5.75	7.12	...	2.0
6	.503	.447	.515	.5050	16.9	20.2	19.8	20.53	— 4.60	081	098	089	089	86	87	84	82	N N E	N E b E	Calm.	N 38 W	6.0	4.4	0.0	2.23	4.77	...	1.0
7	.801	30.032	30.252	30.0552	20.9	22.7	20.5	20.37	— 4.77	082	061	074	078	74	51	67	71	W	N W b W	W b N	N 55 W	2.2	22.3	5.5	8.08	8.29	...	...
8	30.367	30.298	30.030	30.2125	14.7	24.8	25.2	21.25	— 3.88	067	085	093	084	81	66	68	73	Calm.	S b W	S E b E	S 10 E	0.0	2.8	7.0	3.82	4.83	...	...
9	29.689	29.622	29.798	29.7122	34.7	38.2	25.9	32.70	+ 7.57	162	128	093	121	81	56	66	65	S W b S	W S W	W	S 63 W	14.2	17.5	1.2	7.13	7.67	...	...
10	.938	.889	—	—	16.5	33.2	—	—	—	084	132	—	—	91	70	—	—	Calm.	E	E b N	N 85 E	0.0	7.9	13.5	8.60	8.74	0.517	...
11	.219	28.973	.253	.1525	39.7	45.7	39.3	41.05	+16.00	222	268	163	205	91	87	68	79	E b N	S W b S	W S W	S 69 W	4.8	11.3	22.6	13.59	15.87	0.090	...
12	.703	29.895	.866	.8250	35.0	33.7	33.9	33.77	+ 8.68	116	108	155	129	57	56	79	68	W N W	N b W	E S E	N 68 E	20.0	2.2	12.6	3.28	9.92	...	...
13	.542	.581	.852	.6688	34.2	40.2	31.9	35.82	+10.73	177	197	108	148	89	79	59	70	E	W	W	S 81 W	13.8	23.0	2.0	5.49	9.12	...	...
14	.932	.925	.940	.9313	27.7	36.4	32.4	31.90	+ 6.80	136	167	161	152	90	79	87	84	Calm.	S	N E b E	E	0.0	5.0	8.2	3.78	5.83	...	...
15	.782	.541	.265	.5058	35.3	37.1	36.8	36.05	+10.95	170	147	203	175	84	66	93	82	E b S	E	E b S	S 83 E	13.6	12.0	8.0	8.42	8.58	0.330	0.2
16	.156	.254	.494	.3142	36.4	35.7	26.3	32.32	+ 7.32	200	160	138	160	92	76	96	86	S W b W	N W	N W	N 56 W	3.0	19.5	25.4	15.50	15.98	...	...
17	.671	.709	—	—	23.1	24.3	—	—	—	105	098	—	—	85	75	—	—	W b N	N W	Calm.	N 71 W	12.8	7.4	0.0	3.65	4.24	...	0.2
18	.650	.638	.733	.6778	27.7	32.4	28.8	28.98	+ 4.02	139	165	129	138	91	89	81	86	S b W	W S W	N N W	N 68 W	1.6	6.2	7.5	2.75	3.86	...	0.2
19	.766	.722	.719	.7343	25.2	31.4	25.7	27.27	+ 2.38	093	128	130	116	68	72	97	79	N b W	S E	W S W	S 16 E	3.5	3.8	2.8	1.36	2.31	...	0.3
20	.744	.807	.850	.8068	25.2	34.2	29.5	29.17	+ 4.32	115	150	132	132	85	77	80	81	W N W	S S W	W S W	S 47 W	0.2	10.2	4.2	4.13	4.45	...	...
21	.842	.784	.934	.8593	25.9	40.7	33.9	33.90	+ 9.12	120	180	128	143	86	70	66	74	S W b W	S W	Calm.	S 50 W	4.9	9.2	0.0	2.46	5.10	...	...
22	30.187	30.304	30.252	30.2503	24.8	20.5	16.7	21.30	— 3.47	115	088	067	094	87	78	73	81	N E b E	E b N	N E	N 66 E	9.7	15.0	4.5	10.49	10.87	...	...
23	30.150	30.083	30.044	30.0913	20.5	33.0	31.4	27.97	+ 3.28	093	154	143	126	85	82	80	82	N E b N	E b N	N E b E	N 57 E	6.8	4.8	2.0	2.68	2.77	...	...
24	30.049	29.954	—	—	27.4	38.4	—	—	—	117	149	—	—	79	64	—	—	Calm.	E S E	Calm.	S 79 E	0.0	3.5	0.0	1.77	1.85	0.125	...
25	29.905	29.787	29.608	29.7548	38.2	43.3	43.4	41.80	+17.22	212	272	246	246	92	97	87	93	Calm.	E b N	Calm.	N 76 E	0.0	0.5	0.0	1.22	1.22	0.075	...
26	.369	.335	.435	.3855	43.6	45.8	39.7	42.82	+18.30	270	174	193	210	95	56	76	75	E S E	S W b W	W b S	S 62 W	6.0	17.2	6.0	9.75	10.77	0.015	...
27	.462	.480	.552	.5020	33.9	29.9	23.8	29.02	+ 4.67	143	117	097	121	74	70	76	75	N b W	N W b N	N W	N 32 W	4.0	14.0	2.7	7.53	7.72	...	inap.
28	.487	.398	.484	.4552	19.1	25.9	25.9	23.55	— 0.75	084	120	128	109	82	85	89	84	N b W	N E b E	N b W	N 14 W	4.2	7.6	7.2	5.10	6.16	...	...
29	.504	.505	.577	.5313	25.2	25.8	23.4	24.57	+ 0.37	110	100	095	101	81	71	75	76	W N W	N N W	N N W	N 25 W	12.0	10.0	12.4	12.03	12.89	...	inap.
30	.637	.671	.793	.7062	19.4	20.2	14.0	17.37	— 6.73	089	078	062	075	84	72	70	76	N W b N	N W b N	N W	N 30 W	14.0	21.5	4.5	13.01	13.16	...	inap.
31	.823	.793	—	—	7.5	17.3	—	—	—	043	072	—	—	72	77	—	—	N b W	Calm.	Calm.	S 9 E	1.0	0.0	0.0	0.70	1.43	...	inap.
M	29.6560	29.6478	29.7125	29.6753	29.00	33.35	28.47	30.03	+ 5.29	.138	.141	.139	.134	.83	.71	.79	.78	...	...	...	...	6.21	10.40	5.91	......	7.40	1.153	4.0

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR JANUARY.

Highest Barometer........................ 30.408 at 10 a. m., on 8th } Monthly range=
Lowest Barometer .... 28.973 at 8 a. m., on 11th } 1.435

Self-registering Thermom.
- Maximum Temperature........... 47°.4 on p. m. of 26th } Monthly range=
- Minimum Temperature........... 6°.5 on a. m. of 31st } 40.°9
- Mean maximum Temperature .... 35°27 } Mean daily range=
- Mean minimum Temperature .... 23°73 } 11.54
- Greatest daily range .... 25°5 from a. m. to p. m. of 10th.
- Least daily range................. 2°6 from p. m. of 28th to p. m. of 29th.

Warmest day......... 26th ... Mean temperature......... 42.82 } Difference = 25°45.
Coldest day........... 30th ... Mean temperature......... 17°37 }

Maximum { Solar.. 59°.8 on 13th, } Monthly range=
Radiation. { Terrestrial.. 1.8 on 31st. } 58°0

Aurora observed on 2 nights, viz., on 3rd and 8th.
Possible to see Aurora on 17 nights; impossible on 14 nights.

Snowing on 11 days,—depth 4.0 inches; duration of fall 45.2 hours.
Raining on 6 days,—depth 1.152 inches; duration of fall 33.3 hours.

Mean of cloudiness = 0.61.
Most cloudy hour observed, 6 a. m., mean = 0.82; least cloudy hour observed, midnight, mean, =0.47.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
1698.96	1140.37	1304.19	2943.68

Resultant direction N. 71° W.; Resultant Velocity 2.33 miles per hour.
Mean velocity............................ 7.40 miles per hour.
Maximum velocity .... 29.3 miles from 4 to 5 p. m., on 30th.
Most windy day.......................... 16th...Mean velocity 15.98 miles per hour.
Least windy day .... 25th...Mean velocity 1.22 ditto.
Most windy hour ... 2 to 3 p. m..............Mean velocity 10.59 ditto. } Difference
Least windy hour ... 9 to 10 p. m.............Mean velocity 5.63 ditto. } 4.96 miles.

2nd. Halo round the Moon at 6 a. m.
3rd. Faint Auroral light in N. at 9 p. m.
8th. Beautifully coloured Auroral patches and streamers, 6 to 8 p. m.
10th. Solar Halo during the forenoon.
23rd. Solar Halo at 11.30 a. m.
25th. Dense Fog most of the day.
29th. Well defined Lunar Halo and Paraselena at 7.30 p. m.
31st. Faint Lunar Halo at 6 a. m.

The mean Temperature of January 1858 was 6°45 above the average of 19 years, and is remarkable as having been the warmest January during that period.

The fall of Rain and Snow were both in defect of the average, the first by 0.329 and the latter by 9.3 inches.

The velocity of the wind was 0.14 miles per hour below the average of 11 years.

Resultant direction and velocity of the Wind from 1848 to 1858 inclusive were N 72° W. and 2.73 miles.

The month was therefore comparatively warm, dry, and calm.

COMPARATIVE TABLE FOR JANUARY.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	M'n.	Diff. from Aver	Max. ob'd.	Min. ob'd.	Range.	No. of days.	Inch's.	No. of days.	Inch's.	Resultant. Direction.	Resultant. V'y.	Mean Force or Velocity.
1840	° 17.0	° —6.	° 40.6	° —13.8	° 54.4	4	1.395	11	...	...	...	....
1841	25.6	+2.	41.7	— 4.1	45.8	2	2.150	14	...	...	...	0.36 lbs.
1842	27.9	+4.	45.8	1.3	44.5	5	2.170	9	...	...	...	0.78
1843	28.7	+5.	54.4	1.5	52.9	6	4.295	12	14.2	...	...	0.69
1844	20.2	—3.	44.6	— 7.7	52.3	7	3.005	11	24.9	...	...	0.70
1845	26.5	+2.	43.0	— 3.4	46.4	5	imp.	9	22.7	...	...	0.70
1846	26.7	+3.	41.2	0.3	40.9	5	2.335	10	6.0	...	...	0.55
1847	23.3	—0.	42.6	— 2.2	44.8	7	2.135	5	7.5	...	...	1.09
1848	28.7	+5.	51.5	—12.0	63.5	7	2.245	8	7.1	N 82° W	2.03	5.82 mls.
1849	18.5	—5.	40.1	—15.2	55.3	4	1.175	10	9.2	N 63° W	3.76	6.71
1850	29.7	+6.	46.3	10.6	35.7	5	1.250	8	5.2	N 37° W	0.69	5.80
1851	25.5	+1.	43.2	—12.8	56.0	4	1.275	10	7.8	S 77° W	3.26	7.64
1852	18.4	—5.	37.3	— 7.0	44.3	0	0.0	19	30.9	N 68° W	3.14	7.67
1853	23.0	0.	40.9	— 6.6	47.5	1	0.290	6	7.5	N 27° W	2.52	6.34
1854	23.6	0.	45.2	— 4.3	49.5	7	1.270	11	7.5	N 78° W	2.31	6.86
1855	25.9	+2.	48.2	— 4.7	52.9	5	0.525	13	23.3	N 80° W	1.86	7.67
1856	16.0	—7.	33.1	—12.1	45.2	0	0.0	14	13.6	N 75° W	5.24	10.69
1857	12.8	—10.	34.6	—20.1	54.7	3	inap.	16	21.8	N 70° W	4.96	10.31
1858	30.0	+6.	45.8	7.5	38.3	6	1.152	11	4.0	N 71° W	2.33	7.40
M	23.58	...	3.16	—5.52	48.68	4.4	1.481	10.9	13.32	...	...	7.54 mls.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—DECEMBER, 1857.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL. D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32° Fahr.			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind.	Rain in Inches.	Snow in Inches.	Weather, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.				6 A.M.	2 P.M.	10 P.M.
1	29.817	29.754	29.899	40.0	46.0	35.3	.245	.282	.210	.92	.86	.90	S S E	W S W	W S W	7.92	5.60	10.00	...	0.160	...	Rain.	C. C Str. 4.	C. Str. 10.
2	.871	.783	.680	34.7	40.8	35.3	.203	.227	.203	.90	.85	.90	W S W	S W	S b E	9.03	3.83	0.27	...	...	...	C. Str. 8.	C. C. St. 8.	C. C. Str. 8.
3	.623	.814	.902	33.0	30.4	22.4	.189	.160	.120	.89	.86	.82	W	W N W	W N W	16.13	6.03	23.36	...	...	0.50	Do. 10.	C. Str. 10.	Cir. Str. 10.
4	.890	.901	30.014	21.0	24.0	13.0	.104	.097	.083	.78	.65	.82	N W	W	W b N	33.12	1.00	9.30	...	...	...	C. C. St. 6.	Do. 1.	Clear. Aur. Bore.
5	30.031	30.111	.177	6.5	20.0	5.0	.051	.083	.046	.87	.63	.84	N W b N	N E b E	S E b E	1.63	0.93	1.63	...	...	...	Clear.	Clear.	Do.
6	.060	29.884	29.678	3.6	14.0	21.0	.044	.089	.092	.86	.84	.67	N E b E	N E b E	E	5.23	2.97	8.67	...	...	0.93	Do.	C. C. Str. 10.	Sleet.
7	29.590	.634	.810	34.0	43.5	33.3	.178	.241	.187	.83	.79	.89	S W	W b S	S W	16.21	10.17	11.23	...	...	...	C. Str. 6.	Circ. 2.	Clear.
8	.713	.754	.987	33.5	43.3	32.9	.187	.223	.178	.89	.79	.86	S W	W b N	W b N	4.51	3.02	3.36	...	...	...	Clear.	Clear.	Do. Aur. Bor.
9	.831	.643	.378	26.0	31.0	37.7	.112	.171	.22	.70	.80	.91	N E b E	N E b E	S S E	7.63	8.51	6.51	...	0.240	0.10	Do.	Sleet.	Rain.
10	.370	.375	.604	35.5	37.5	23.0	.210	.207	.106	.90	.84	.73	S W b W	S W b W	W N W	9.33	7.35	16.81	...	...	...	C. St. 4.	C. St. 6.	C. C. St. 4.
11	.990	30.030	30.279	11.1	12.8	9.2	.063	.068	.069	.67	.67	.77	N W b N	N W b N	W	23.33	8.72	10.51	...	...	...	Clear.	C. C. St. 4.	Clear.
12	30.326	.262	.232	9.0	20.8	21.6	.068	.098	.098	.78	.73	.74	W	W	W S W	8.73	7.50	5.42	...	...	...	C. St. 4.	C. Str. 4.	Do.
13	.187	29.914	29.818	27.0	39.0	34.6	.128	.214	.187	.76	.84	.85	W S W	S W	S W	18.30	8.06	13.98	...	...	...	Clear.	Light Cir. 2.	Do.
14	29.815	.820	30.018	33.1	40.1	35.2	.187	.210	.186	.90	.79	.83	S W b S	S W b W	W b N	7.80	4.92	8.08	...	...	...	C. C. Str. 8.	C. Str 10.	C. St. 10.
15	30.198	30.260	.185	19.1	24.1	20.2	.091	.091	.089	.73	.63	.68	N E by E	N E b E	N E b E	10.22	3.93	2.47	...	...	...	C. Str. 10.	C. C. Str 4.	Clear.
16	.062	.184	.131	19.6	31.1	24.7	.091	.152	.135	.73	.78	.86	N E by E	N N W	N E b E	5.42	0.82	0.01	...	...	1.10	Snow.	C. Str 6.	C. St. 10.
17	29.981	29.900	29.888	25.0	35.6	32.5	.107	.192	.182	.78	.83	.87	N E by E	S b W	S b W	1.00	0.01	0.01	...	...	...	C. Str. 10.	Do. 6.	Do. 10.
18	.650	.350	.340	32.2	34.4	34.0	.191	.203	.205	.90	.94	.95	N E by E	N E b E	N W b N	2.90	8.81	3.28	...	0.876	...	Do. 10.	Rain.	Rain.
19	.810	.950	30.147	22.5	18.8	12.0	.102	.103	.075	.80	.78	.74	W	W	W N W	12.73	14.30	15.77	...	0.074	...	C. W. 8.	C. Str. 10.	C. St. 9.
20	30.272	30.256	.346	9.1	11.3	7.7	.065	.066	.067	.73	.68	.71	N W	W	W S W	9.80	4.11	4.73	...	...	...	Do. 10.	Do. 8.	Clear. Aur. Bor.
21	.199	.100	29.937	7.4	30.5	17.0	.051	.145	.096	.87	.78	.83	S E	S E	E b N	2.90	1.05	2.31	...	...	...	Clear.	Clear.	C. St. 8.
22	29.479	29.275	.837	20.3	27.0	22.1	.114	.137	.096	.87	.82	.70	N E by E	N b E	W b N	7.42	6.46	9.10	...	...	3.74	Snow.	Snow.	C. St. 10.
23	.888	.206	.198	13.0	25.3	24.0	.083	.123	.138	.82	.79	.90	S W	S E	S W	17.53	2.22	3.13	...	...	1.04	C. St. 8.	C. Str, 10.	Snow.
24	.347	.683	.974	20.1	12.4	0.1	.114	.068	.038	.87	.67	.85	W	N W	W S W	19.51	15.70	18.99	...	...	0.10	Do. 4.	Do. 4.	Clear.
25	30.003	.908	.854	−10.7	8.2	−0.4	.022	.045	.034	.78	.68	.74	W b N	S b W	N E b E	0.01	0.00	0.00	...	...	...	Clear.	Do. 10.	C. C. 4 Lun. Halo.
26	29.820	.809	.904	−3.5	8.0	1.4	.031	.038	.036	.83	.73	.84	N E by E	N E b E	N E b E	0.23	2.32	0.00	...	...	...	C. St. 8.	Do. 10.	C. St. 10.
27	30.098	30.138	30.002	−13.0	7.2	−3.0	.018	.040	.031	.74	.70	.83	N E by E	S E	E N E	0.36	0.03	0.22	...	...	...	Clear.	C. C. Str.	C. C. St. 6. L. Halo
28	29.658	29.595	29.840	0.0	35.7	27.0	.030	.192	.140	.79	.83	.88	N E by E	W S W	W	1.40	0.37	11.28	...	...	0.20	Snow.	C. Str. 8.	Cir. Cum. 6.
29	.869	.820	.909	19.5	28.2	20.5	.107	.135	.086	.83	.78	.70	S E by S	N E b E	N W b N	0.80	1.62	0.75	...	...	...	C. Str. 10.	Do. 10.	C. St. 5.
30	.800	.680	.656	12.5	26.0	28.0	.070	.129	.144	.73	.80	.83	N E by E	N E b E	E by S	0.31	2.06	3.15	...	...	2.10	C. C. Str. 10.	Snow.	Snow.
31	.170	28.880	.183	30.5	25.0	30.1	.178	.123	.100	.92	.79	.80	E by N	N E b E	W by S	12.21	2.30	8.21	...	...	17.0	Snow.	Do.	Do.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—JANUARY, 1858.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL.D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. correcte and reduced to 32°			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind.	Rain in Inches.	Snow in Inches.	Weather, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.				6 A.M.	2 P.M.	10 P.M.
1	29.531	29.470	29.827	14.4	25.3	21.5	.075	.123	.081	.72	.76	.60	S S E	E b W	S W	17.83	0.08	3.72	...	...	2.90	C. Str. 10.	Snow.	Clear.
2	.916	.741	.700	10.7	29.9	26.5	.082	.138	.146	.88	.74	.88	S b W	S W	W b S	5.57	0.78	14.50	...	...	...	Clear.	Clear.	Do.
3	.788	.416	.438	8.0	16.0	12.0	.056	.087	.070	.79	.78	.73	S W b S	S b E	N b E	4.00	0.23	12.53	...	...	4.00	C. C. Str. 4.	Snow.	Cirr. Str. 10.
4	.225	.070	.211	10.9	4.0	38.0	.082	.225	.217	.88	.79	.80	S b W	E b S	W b S	2.00	12.82	20.62	...	...	...	C. Str. 8.	C. C. Str. 8.	Clear.
5	.656	.714	.995	11.2	9.6	—5.0	.072	.079	.031	.78	.88	.85	N	N	E	23.11	0.76	7.07	...	...	...	Clear.	Clear.	Do. Au. Bor.
6	.947	.852	.816	—6.0	2.8	2.0	.029	.047	.044	.81	.84	.84	N E b E	N E b E	N E b E	17.85	12.22	17.40	...	...	...	C. C. Str. 6.	C. Str. 10.	Snow.
7	.954	30.057	30.338	8.2	14.6	—1.6	.069	.038	.023	.79	.70	.85	W	W	N W b W	13.72	4.00	5.70	...	...	0.38	C. Str. 10.	Clear.	Clear.
8	30.587	.536	.563	—10.2	8.9	—0.3	.059	.039	.026	.78	.82	.85	W b N	W S W	S S W	9.26	3.06	4.73	...	...	...	Clear.	Do.	Do. Au. Bor.
9	29.963	29.916	29.803	—8.0	2.0	13.0	.051	.093	.050	.79	.95	.92	E b N	W N W	W N W	2.73	1.82	1.45	...	...	...	Do.	Do.	Do.
10	30.147	30.213	30.259	3.7	20.1	0.0	.094	.050	.042	.85	.72	.84	N W	W S W	E	18.75	0.57	0.76	...	...	...	Do.	Do.	Do. ft. A. Bor.
11	29.987	29.357	29.356	28.0	40.3	39.5	.153	.245	.226	.88	.92	.92	S b E	S b E	S S W	20.66	10.87	10.12	...	0.381	...	Rain.	C. Str. 10.	Rain.
12	.580	30.002	30.238	27.0	23.0	8.6	.146	.087	.058	.88	.60	.80	W	W b N	S W b W	18.09	23.63	7.36	...	...	...	C. C. Str. 8.	Cirr. 4.	Clear.
13	30.065	29.912	29.948	—4.2	24.0	18.0	.031	.100	.087	.79	.74	.84	E N E	W b S	W b S	3.60	7.46	3.63	...	...	0.90	Clear.	C. Str. 4.	Do. Au. Bor.
14	.146	30.130	30.270	10.0	35.1	14.7	.062	.178	.070	.86	.81	.82	W S W	W S W	E b N	3.00	1.12	0.00	...	...	...	Do.	Clear.	Do.
15	.292	.151	.034	4.7	13.9	15.0	.043	.070	.074	.75	.82	.81	E	N E b E	N E b E	5.93	10.66	6.61	...	...	1.30	C. C. Str. 8.	C. Str. 10.	Snow.
16	29.412	29.215	29.480	31.2	31.0	30.1	.162	.162	.143	.89	.89	.79	N E b E	N E b E	N W	12.17	6.10	1.10	...	0.120	1.10	Rain.	Rain.	Snow.
17	.766	.729	.944	10.1	14.6	4.2	.057	.070	.046	.99	.82	.84	N W	W S W	S S W	16.03	9.07	4.57	...	...	1.20	Str. 2.	Clear.	Cl. Au. Bor.
18	.966	.854	.967	—10.2	12.2	4.1	.022	.151	.041	.36	.63	.74	S b W	S b W	S b W	0.03	0.00	0.27	...	...	...	Cir. Str. 4.	Cirr. Str. 4.	Do.
19	30.018	.936	.987	—9.2	13.2	2.2	.054	.067	.042	.78	.80	.84	S b W	S E b E	E	0.92	0.05	0.00	...	...	...	Do. 6.	C. Str. 10.	C. Str. 10
20	29.995	.997	30.036	—9.3	18.4	14.7	.022	.075	.064	.76	.70	.70	S S E	S S E	S b W	0.02	0.31	1.21	...	...	...	Str. 4.	Do. 4.	Do. 10.
21	.932	.880	.100	15.6	37.1	19.3	.072	.102	.084	.75	.82	.71	S W	W b N	N b E	8.88	15.43	10.33	...	...	...	Cir. Str. 8.	Do. 8.	Do. 4.
22	30.601	30.617	.697	—9.7	9.2	—10.7	.020	.042	.017	.69	.59	.57	N E b E	S E b E	S E b S	10.27	0.96	0.35	...	...	...	Clear.	Clear.	Clear.
23	.675	.355	.405	—18.7	1.0	—5.5	.013	.030	.024	.69	.69	.64	N E b E	N E b E	N E b E	0.02	0.02	7.11	...	...	...	Do.	Do.	Do.
24	.406	.254	30.313	—9.0	22.4	14.0	.024	.084	.059	.74	.71	.66	N E b E	N E b E	N E b E	0.50	0.10	0.00	...	...	...	Do.	Lgt Cirr.	Cirr. 4.
25	.154	.087	.055	21.4	40.0	33.2	.089	.212	.175	.72	.82	.81	N b E	S S E	S S E	0.02	0.11	1.17	...	0.076	...	C. Str. 10.	Rain.	Rain.
26	29.703	29.511	29.503	34.6	43.2	37.1	.183	.262	.208	.90	.84	.96	S b E	S E b E	S b E	0.06	1.77	9.36	...	0.174	...	Raw.	Do.	C. Str. 10.
27	.570	.614	.751	32.4	38.7	21.5	.169	.212	.112	.84	.82	.95	S b E	S S E	S E b E	12.63	12.07	8.57	...	Inp.	...	Str. 2.	Str. Rain.	Do. 10.
28	.745	.709	.755	19.0	19.9	15.3	.090	.084	.070	.78	.71	.70	N E b E	N E b E	N E b E	11.65	16.50	8.02	...	...	...	C. Str. 10.	C. Str. 10.	Do. 10.
29	.801	29.664	.705	13.4	22.0	18.6	.067	.098	.092	.81	.74	.90	N E b E	N E b E	N W	21.28	9.40	5.35	...	...	...	Do. 10.	Do. 10.	Do. 10.
30	.643	.579	.796	18.0	21.9	6.4	.081	.082	.042	.77	.62	.66	W N W	W N W	W N W	8.90	10.75	22.31	...	...	...	Do. 10.	Do. 10.	Cirr. 2.
31	.917	.953	30.080	—10.1	5.0	—4.6	.017	.031	.029	.57	.56	.82	W N W	W S W	W S W	23.12	10.20	5.95	...	...	...	Clear.	Clear.	Clear.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR DECEMBER.

Barometer	Highest, the 30th day	30.346
	Lowest, the 31st	28.880
	Monthly Mean	29.743
	Monthly Range	1.466
Thermometer	Highest, the 1st day	46°.0
	Lowest, the 27th day	—13°.2
	Monthly Mean	14°.94
	Monthly Range	59°.2

Greatest intensity of the Sun's Rays .... 89°.0

Lowest point of Terrestrial Radiation .... —13°.5

Mean of Humidity .... .890

Rain fell on 5 days amounting to 1.350 inches; it was raining 32 hours 30 minutes.

Snow fell on ten days, amounting to 26.81 inches; it was snowing 68 hours 50 minutes.

The most prevalent wind was N. E. by E.

The least prevalent wind E.

The most windy day the 24th; mean miles per hour 16.40.

Least windy day the 25th; mean miles per hour 0.00.

Aurora Borealis visible on 3 nights.

Lunar Halo on 2 nights.

The electrical state of the Atmosphere has indicated moderate intensity.

Ozone was in rather large quantity.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR JANUARY.

Barometer	Highest the 22nd day	30.697
	Lowest the 4th day	29.070
	Monthly Mean	29.967
	Monthly Range	1.627
Thermometer	Highest the 26th day	43°.4
	Lowest the 23rd day	—18°.7
	Monthly Mean	13°.76
	Monthly Range	62°.1

Greatest Intensity of the Sun's Rays .... 51°.9

Lowest Point of Terrestrial Radiation .... —19°.3

Mean of Humidity .... .796

Rain fell on 5 days, amounting to 0.751 inches; it was raining 34 hours and 40 minutes.

Snow fell on 7 days, amounting to 11.75 inches. It was snowing 34 hours and 35 min.

Most prevalent wind, N. E. by E. Least-prevalent wind, E.

Most windy day, the 13th day; mean miles per hour, 16.36.

Least windy day, the 18th; mean miles per hour, 0.10.

Aurora Borealis visible on 5 nights.

Zodiacal Light very bright.

Parhelia and Mock Suns visible on 2 days.

The Electrical state of the atmosphere has indicated moderate intensity.

Ozone was in rather large quantity.

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TORONTO:

PRINTED BY LOVELL AND GIBSON, YONGE STREET.

1858.

1858, March 9.

Appended to the "Canadian Journal of Industry," etc. for March, 1858.

(Gift of the Canadian Institute.)

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OF THE

CANADIAN INSTITUTE LIBRARY.

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"	7	" British	5
C	7	" National	6
"	7	Dictionary of Arts and Manufactures, Ure's	3
D	7	" Biographical	12
C	2	" of Classical Quotations	1
D	7	" Commercial, McCulloch's	1
C	7	" of Dates, Hadyn's	1
D	7	" Gardeners', Don's	4
"	7	" Johnson's	2
E	8	" of Law, Jacobs'	1
B	7	" of Mechanics, Appleton's	1
"	7	" Mythological, Smith's	3
"	7	" of Painting, Spooner's	1
C	7	" Topographical	6
"	7	" of Weights and Measures	1
G	9	Dictionnaire Universelle	6
B	7	Encyclopædia of Agriculture, Loudon's	1
"	7	" of Architecture "	1
"	7	" " Gwilt's	1
	8	" Britannica	
"	7	" of Civil Engineering, Gwilt's	1
"	7	" " " Cresy's	1
B	7	" of Gardening, Loudon's	1
B	7	" of Trees, Loudon's	1
B	7	Gazetteer, Harper's	
"	7	" Imperial	2
"	7	" Johnston's General	1
B	7	Lexicon, Latin-English	1

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B	2	Almanac, American	1
"	2	" British	2
"	2	Almanack de Gotha	1
A	1	Anglo-American Magazine	7
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"	4	Annual of Scientific Discovery	2
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A	1	Bulletin de la Société Géologique	2
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"	4	" of Chemical Society	3
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"	1	" of Highland Agricultural Society	2
"	2	" of Microscopical Society	4
"	4	" of Society of Arts	4
A	4	Liebig and Kopp's Chemical Reports	4
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"	8	" Appleton's Merchants'	3
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"	8	" Penny	2
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"	4	Newton's Journal of Arts, Sciences and Manufactures	2
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		" Geological Society	2

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THE

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THE CANADIAN JOURNAL.

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No. XV.—MAY, 1858.

ON THE THEORY OF IGNEOUS ROCKS AND VOLCANOS.

BY T. STERRY HUNT,

OF THE GEOLOGICAL SURVEY OF CANADA.

Read before the Canadian Institute, 13th March, 1858.

In a note in the American Journal of Science for January, 1858, I have ventured to put forward some speculations upon the chemistry of a cooling globe, such as the igneous theory supposes our earth to have been at an early period. Considering only the crust with which geology makes us acquainted, and the liquid and gaseous elements which now surround it, I have endeavored to show that we may attain to some idea of the chemical conditions of the cooling mass by conceiving these materials to again re-act upon each other under the influence of an intense heat. The quartz, which is present in such a great proportion in many rocks, would decompose the carbonates and sulphates, and aided by the presence of water, the chlorids both of the rocky strata and the sea, while the organic matters and the fossil carbon would be burned by the atmospheric oxygen. From these reactions would result a fused mass of silicates of alumina, alkalies, lime, magnesia, iron, etc., while all the carbon, sulphur and chlorine, in the form of acid gases, mixed with watery vapour, azote, and a probable excess of oxygen, would form an exceedingly dense atmosphere. When the cooling permitted condensation, an acid rain would fall upon the heated crust of the earth, decomposing the silicates, and giving rise to chlorids and sulphates of the various bases, while the separated silica would probably take the form of crystalline quartz.

In the next stage, the portions of the primitive crust not covered by the ocean, undergo a decomposition under the influence of the hot

moist atmosphere charged with carbonic acid, and the feldspathic silicates are converted into clays with separation of an alkaline silicate, which, decomposed by the carbonic acid, finds its way to the sea in the form of alkaline bicarbonate, where, having first precipitated any dissolved sesquioxyds, it changes the dissolved lime-salts into bicarbonate, which precipitated chemically or separated by organic agencies, gives rise to limestones, the chlorid of calcium being at the same time replaced by common salt. The separation from the water of the ocean, of gypsum and sea-salt, and of the salts of potash, by the agency of marine plants, and by the formation of glauconite, are considerations foreign to our present study.

In this way we obtain a notion of the processes by which, from a primitive fused mass, may be generated the silicious, calcareous and argillaceous rocks which make up the greater part of the earth's crust, and we also understand the source of the salts of the ocean. But the question here arises whether this primitive crystalline rock, which probably approached to dolerite in its composition, is now anywhere visible upon the earth's surface. It is certain that the oldest known rocks are stratified deposits of limestone, clay and sands, generally in a highly altered condition, but these, as well as more recent strata, are penetrated by various injected rocks, such as granites, trachytes, syenites, porphyries, dolerites, phonolites, etc. These offer, in their mode of occurrence, not less than their composition, so many analogies with the lavas of modern volcanos, that they are also universally supposed to be of igneous origin, and to owe their peculiarities to slow cooling under pressure. This conclusion being admitted, we proceed to inquire into the sources of these liquid masses, which, from the earliest known geological period up to the present day, have been from time to time ejected from below. They are generally regarded as evidences both of the igneous fusion of the interior of our planet, and of a direct communication between the surface and the fluid nucleus, which is supposed to be the source of the various ejected rocks.

These intrusive masses, however, offer very great diversities in their composition, from the highly silicious and felspathic granites, eurites, and trachytes, in which lime, magnesia and iron are present in very small quantities, and in which potash is the predominant alkali, to those denser basic rocks, dolorite, dierite, hyperite, melaphyre, euphotide, trap and basalt; in these, lime, magnesia and iron-oxyd are abundant, and soda prevails over the potash. To account for these differences in the composition of the injected rocks, Phillips, and after him Durocher, suppose the interior fluid mass to have separated into a

denser stratum of the basic silicates, upon which a lighter and more silicious portion floats like oil upon water, and that these two liquids, occasionally more or less modified by a partial crystalization and eliquation, or by a refusion, give rise to the principal varieties of silicious and basic rocks, while from the mingling of the two zones of liquid matter, intermediate rocks are formed. (Phillips' *Manual of Geology*, p. 556, and Durocher, *Annales des Mines*, 1857, vol, 1, p. 217.)

An analogous view was suggested by Bunsen in his researches on the volcanic rocks of Iceland, and extended by Streng to similar rocks in Hungary and Armenia. These investigators suppose a trachytic and a pyroxenic magma of constant composition, representing respectively the two great divisions of rocks which we have just distinguished; and have endeavored to calculate from the amount of silica in any intermediate variety, the proportions in which these compounds must have been mingled to produce it, and consequently the proportions of alumina, lime, magnesia, iron-oxyd and alkalies which such a rock may be expected to contain. But the amounts thus calculated, as may be seen from Dr. Streng's results, do not always correspond with the results of analysis. (Streng, *Annales de Chimie et de Physique*, 3rd series, vol. 39, p. 52.) Besides there are varieties of intrusive rocks, such as the phonolites, which are highly basic, and yet contain but very small quantities of lime, magnesia and iron oxyd, being essentially silicates of alumina and alkalies in part hydrated.

We may here remark that many of the so-called igneous rocks are often of undoubted sedimentary origin. It will scarcely be questioned that this is true of many granites, and it is certain that all the feldspathic rocks coming under the categories of hyperite, labradorite, euphotide, diorite, amphibolite, which make such so large a part of the Laurentian system in North America, are of sedimentary origin. They are here interstratified with limestones, dolomites, serpentines, crystalline schists and quartzites, which are often conglomerate. The same thing is true of similar feldspathic rocks in the altered Silurian strata of the Green Mountains. These metamorphic strata have been exposed to conditions which have rendered some of them quasi-fluid or plastic. Thus for example, crystalline limestone may be seen in positions which have led many observers to regard it as intrusive rock, although its general mode of occurrence leaves no doubt as to its sedimentary origin. We find in the Laurentian system that the limestones sometimes envelope the broken and contorted fragments of the beds of quartzite, with which they are often interstratified, and pene-

trate like a veritable trap into fissures in the quartzite and gneiss. A rock of sedimentary origin may then assume the conditions of a so-called igneous rock, and who shall say that any of the intrusive granites, dolerites, euphotides, and serpentines, have an origin distinct from the metamorphic strata of the same kind, which make up such vast portions of the older stratified formation? To suppose that each of these sedimentary rocks has also its representative among the ejected products of the central fire, seems a hypothesis not only unnecessary, but when we consider their varying composition, untenable.

We are next led to consider the nature of the agencies which have produced this plastic condition in various crystalline rocks. Certain facts, such as the presence of graphite in contact with carbonate of lime, and oxyd of iron, not less than the presence of alkaliferous silicates, like the feldspars in crystalline limestones, forbid us to admit the ordinary notion of the intervention of an intense heat, such as would produce an igneous fusion, and lead us to consider the view first put forward by Poulett Scrope, * and since ably advocated by Scheerer and by Elie de Beaumont, of the intervention of water aided by fire, which they suppose may communicate a plasticity to rocks at a temperature far below that required for their igneous fusion. The presence of water in the lavas of modern volcanos led Mr. Scrope to speculate upon the effect which a small portion of this element might exert at an elevated temperature and under pressure, in giving liquidity to masses of rock, and he extended this idea from proper volcanic rocks to granites.

Scheerer in his inquiry into the origin of granite has appealed to the evidence afforded us by the structure of this rock, that the more fusible feldspars and mica crystallized before the almost infusible quartz. He also points to the existence in granite of what he has called pyrognomic minerals, such as allanite and gadolinite, which, when heated to low redness, undergo a peculiar and permanent molecular change, accompanied by an augmentation in density, and a change in chemical properties, a phenómenon completely analogous to that offered by titanic acid and chromic oxyd in their change by ignition from a soluble to an insoluble condition. These facts seem to exclude the idea of igneous fusion, and point to some other cause of liquidity. The presence of natrolite as an integral part of the zircon-syenites of Norway, and of talc and chlorite and other hydrous minerals in many granites show that water was not excluded from the original granitic paste.

Scheerer appeals to the influence of small portions of carbon and

* See Journal of Geol. Society of London, vol. xii., p. 326.

sulphur in greatly reducing the fusing point of iron. He alludes to the experiments of Schafhautl and Wöhler, which show that quartz and apophylite may be dissolved by heated water under pressure and recrystallized on cooling. He recalls the aqueous fusion of many hydrated salts, and finally suggests that the presence of a small amount of water, perhaps five or ten per cent., may suffice at a temperature which may approach that of redness, to give to a granitic mass a liquidity, partaking at once of the characters of an igneous and an aqueous fusion.

This ingenious hypothesis, sustained by Scheerer in his discussion with Durocher,* is strongly confirmed by the late experiments of Daubrée. He found that common glass, a silicate of lime and alkali, when exposed to a temperature of 400° C., in presence of its own volume of water, swelled up and was transformed into an aggregate of crystals of wollastonite, the alkali with the excess of silica separating, and a great part of the latter crystallizing in the form of quartz. When the glass contained oxyd of iron, the wollastonite was replaced by crystals of diopside. Obsidian in the same manner yielded crystals of feldspar, and was converted into a mass like trachyte. In these experiments upon vitreous alkaliferous matters, the process of nature in the metamorphosis of sediments is reversed, but Daubrée found still farther that kaolin, when exposed to a heat of 400° C. in the presence of a soluble alkaline silicate, is converted into crystalline feldspar, while the excess of silica separates in the form of quartz. He found natural feldspar and diopside to be extremely stable in the presence of alkaline solutions. These beautiful results were communicated to the French Academy of Sciences on the 16th of November last, and as the author well remarked, enable us to understand the part which water may play in giving origin to crystalline minerals in lavas and intrusive rocks. The swelling-up of the glass also shows that water gives a mobility to the particles of the glass at a temperature far below that of its igneous fusion.

I had already shown in the Report of the Geological Survey of Canada for 1856, p. 479, that the reaction between alkaline silicates and the carbonates of lime, magnesia and iron at a temperature of 100° C. gives rise to silicates of these bases, and enables us to explain their production from a mixture of carbonates and quartz, in the presence of a solution of alkaline carbonate. I there also suggested

* NOTE.—See for the arguments on the two sides, Bulletin of the Geol. Soc. of France, Second series, vol. iv., p. p. 468, 1018; vi., 644; vii., 276; viii., 500; also, Elie de Beaumont, Ibid. vol. iv., p. 1312. See also the recent microscopical observations of Mr. Sorby, confirming the theory of the aqueous-igneous origin of granite.—*L. E. & D. Phil. Mag.*, February, 1858.

that the silicates of alumina in sedimentary rocks may combine with alkaline silicates to form feldspars and mica, and that it would be possible to crystallize these minerals from hot alkaline solutions in sealed tubes. In this way I explained the occurrence of these silicates in altered fossiliferous strata. My conjectures are now confirmed by the experiments of Daubrée, which serve to complete the demonstration of my theory of the normal metamorphism of sedimentary rocks by the interposition of heated alkaline solutions.

But to return to the question of intrusive rocks: Calculations based on the increasing temperature of the earth's crust as we descend, lead to the belief that at a depth of about twenty-five miles the heat must be sufficient for the igneous fusion of basalt. The recent observations of Hopkins, however, show that the melting points of various bodies, such as wax, sulphur and resin are greatly and progressively raised by pressure, so that from analogy we may conclude that the interior portions of the earth are, although ignited, solid from great pressure. This conclusion accords with the mathematical deductions of Mr. Hopkins, who, from the precession of the equinoxes, calculates the solid crust of the earth to have a thickness of 800 or 1,000 miles. Similar investigations by Mr. Hennessey however assign 600 miles as the maximum thickness of the crust. The region of liquid fire being thus removed so far from the earth's surface, Mr. Hopkins suggests the existence of lakes or limited basins of molten matter which serve to feed the volcanos.

Now the mode of formation of the primitive molten crust of the earth would naturally exclude all combined or intermingled water, while all the sedimentary rocks are necessarily permeated by this liquid, and consequently in a condition to be rendered semi-fluid by the application of heat as supposed in the theory of Scrope and Scheerer. If now we admit that all igneous rocks, ancient plutonic masses, as well as modern lavas, have their origin in the liquefaction of sedimentary strata, we at once explain the diversities in their composition. We can also understand why the products of volcanos in different regions are so unlike, and why the lavas of the same volcano vary at different periods. We find an explanation of the water and carbonic acid which are such constant accompaniments of volcanic action, as well as the hydrochloric acid, sulphuretted hydrogen and sulphuric acid, which are so abundantly evolved by certain volcanos. The reaction between silica and carbonates must give rise to carbonic acid, and the decomposition of sea-salt in saliferous strata by silica in the presence of water, will generate hydrochloric acid, while gypsum

in the same way will evolve its sulphur in the form of sulphurous acid mixed with oxygen. The presence of fossil plants in the melting strata would generate carburetted hydrogen gases, whose reducing action would convert the sulphurous acid into sulphuretted hydrogen; or the reducing agency of the carbonaceous matters might give rise to sulphuret of calcium which would be in its turn decomposed by carbonic acid or otherwise. The intervention of carbonaceous matters in volcanic phenomenon is indicated by the recent investigations of Deville, who has found carburetted hydrogen in the gaseous emanations of the region of Etna and the lagoons of Tuscany. The ammonia and the nitrogen of volcanos are also in many cases probably derived from organic matters in the strata decomposed by subterranean heat. The carburetted hydrogen and bitumen evolved from mud volcanos, like those of the Crimea and of Bakou, and the carbonized remains of plants in the *moya* of Quito, and in the volcanic matters of the Island of Ascension, not less than the infusiorial remains found by Ehrenberg in the ejected matters of most volcanos, all go to show that fossiliferous sediments are very generally implicated in volcanic phenomena. It is to Sir John F. W. Herschel that we owe, so far as I am aware, the first suggestions of the theory of volcanic action which I have here brought forward. In a letter to Sir Charles Lyell, dated February 20, 1836, (Proceedings Geol. Soc. London, vol. 11, p. 548), he maintains that with the accumulation of sediment the isothermal lines in the earth's crust must rise, so that strata buried deep enough will be crystallized and metamorphosed, and eventually be raised, with their included water, to the melting point. This will give rise to evolutions of gases and vapours, earthquakes, volcanic explosions etc., all of which results must, according to known laws, follow from the fact of a high central temperature; while from the mechanical subversion of the equilibrium of pressure, following upon the transfer of sediments, while the yielding surface reposes upon a mass of matter partly liquid and partly solid, we may explain the phenomena of elevation and subsidence. Such is a summary of the views put forward more than twenty years since by this eminent philosopher, which, although they have passed almost unnoticed by geologists, seem to me to furnish a simple and comprehensive explanation of several of the most difficult problems of chemical and dynamical geology.

To sum up in a few words the views here advanced. We conceive that the earth's solid crust of anhydrous and primitive igneous rock is everywhere deeply concealed beneath its own ruins, which form a

great mass of sedimentary strata permeated by water. As heat from beneath invades these sediments, it produces in them that change which constitutes normal metamorphism. These rocks at a sufficient depth are necessarily in a state of igneo-aqueous fusion, and then in the event of fracture of the overlying strata, may rise among them, taking the form of eruptive rocks. Where the nature of the sediments is such as to generate great amounts of elastic fluids by their fusion, earthquakes and volcanic eruptions may result, and these, other things being equal, will be most likely to occur under the more recent formations.

ON THE ASSAYING OF COALS BY THE BLOWPIPE.

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The blowpipe had been employed with great success for nearly a century in the examination of minerals and chemical products, with a view to distinguish these numerous bodies from one another, and also to ascertain their general composition, when Edward Harkort of Freiberg first applied it to the quantitative investigation of certain silver ores and furnace products. Plattner, who had worked with Harkort, subsequently extended this application to the assaying of various metallic substances, and added in no small degree to the utility of the instrument, by the invention of new methods of research and many new appliances, published collectively in his well-known *Probirkunst mit dem Löthrohre.** No one, however, has yet attempted to employ the blowpipe in the practical examination of coals, an application peculiarly fitted to it: since, in travelling, and at other times when only the blowpipe-apparatus can be conveniently made use of, determinations of the kind in question are often desirable. Having had some experience in the use of the instrument, I have attempted to supply this

* This work reached in 1853 its fourth edition. Harkort's earlier publication (1827), of which, however, merely the first part was issued, bore a similar title. For all that concerns the history and general application of the blowpipe, the reader may consult the fourth edition of the standard work by Berzelius, as translated by Whitney. A new edition of this work, incorporating the various tests and discoveries published since the death of its distinguished author, is much required.

deficiency; and, thinking the subject of sufficient interest to be brought before the Canadian Institute, I have embodied in the present paper, the results of my investigations. The subject may be conveniently considered under the following heads:—(1). Coal in its different aspects; (2). Instruments and appliances; (3). Operations.

§ 1. DIFFERENT VARIETIES OF COAL.

Without attending to minor distinctions or points of merely local value, we may arrange all varieties of coal, so far as regards practical purposes, under the following subdivisions:

1. Anthracites.
2. Anthracitic or Dry Coals.
3. Caking or Fat Coals.
4. Cannel or Gas Coals.
5. Brown Coals or Lignites.

These varieties pass by almost insensible transitions into one another. Thus, the cannel coals are related to the lignites by the different kinds of jet, some of which are referable to the one, and some to the other subdivision. Between the caking and the cannel coals there are also various links; whilst the anthracitic or dry coals, on the other hand—passing by excess of bitumen into the caking coals, and by a diminution of bituminous matter into the anthracites—serve to connect the first and third divisions. The typical or normal specimens of each of these five varieties, however, are sufficiently well marked.

1. *Anthracites.*—The true or normal anthracites possess a brilliant sub-metallic lustre, a degree of hardness varying from 3.0 to 3.25*, and a specific gravity of at least 1.33. A specimen from Pensylvania gave 1.51; another specimen, 1.44; one from the department of the Isère in France, 1.56; and three from Wales yielded respectively 1.33, 1.37, 1.34. It should be stated, however, that many of the Welsh specimens belong strictly to the division of anthracitic coals, rather than to that of the true anthracites. The normal anthracites exhibit also a black or grayish-black streak; and all are good conductors of electricity. The latter character may be conveniently shewn by the method first pointed out by VonKobell. A fragment placed in a solution of sulphate of copper (blue vitriol) in contact with a strip of zinc, will become quickly coated with a deposit of metallic copper: a phenomenon not exhibited in the case of common coal. Deducting ash and moisture, true anthracites present, as a mean, the following

* Hausmann in his *Handbuch der Mineralogie*, gives 2.5 as the extreme hardness of all coals; but this is evidently erroneous, as many specimens, not only of anthracite, but of common and cannel coals, scratch calcareous spar.

composition:—Carbon, 92½, Hydrogen 3½, Oxygen (with trace of Nitrogen) 4. All yield an amount of coke equal to or exceeding 89 per cent. The coke is frequently pulverulent, never agglutinated.

The comportment of anthracite before the blowpipe has not hitherto been given in detail. It is as follows:—*Per se*, the assay quickly loses its metallic brilliancy. After continued ignition, small white specks of ash appear on its edges. In borax it dissolves very slowly, with constant escape of bubbles. It is not attacked by salt of phosphorus; the assay works to the top of the bead and slowly burns away. In carbonate of soda, it effervesces, scintillates, and turns rapidly in the bead; and the soda is gradually absorbed. In the bulb tube a little water is always given off, but without any trace of bituminous matter.

As regards their geological position, the true anthracites belong chiefly to the middle portion of the Palæozoic series, below the Carboniferous formation; or otherwise, they constitute the under portion of the coal measures. Frequently also, anthracites occur in the vicinity of erupted rocks, and amongst metamorphic strata, as manifest alterations of ordinary coal.

2. *Anthracitic Coals.*—These are often confounded with the true anthracites, into which indeed, as already stated, they gradually merge. Normally, they differ from the true anthracites in being non-conductors of electricity, in burning more easily and with a very evident yellow flame, in yielding a small quantity of bituminous matter when heated in a tube closed at one end, and in furnishing an amount of coke below 80 per cent. The coke is also in general more or less agglutinated, although it never presents the fused, mamillated appearance of that obtained from caking coal. The mean composition, ash and moisture deducted, may be represented as follows:—Carbon 89½, Hydrogen 5, Oxygen (with trace of Nitrogen) 5½; or Carbon 89, Hydrogen 5, Oxygen (with trace of Nitrogen) 6.

3. *Caking Coals.*—These are often termed, technically, "Fat coals." They constitute the type-series of the coals, properly so called. All yield a fused and mamillated coke, varying in amount from 65 to 70 per cent. Sp. gr.=1.27–1.32. Commonly mixed with thin layers of strongly soiling "mineral charcoal" or fibrous anthracite. Mean composition (ash and moisture excluded): Carbon 87.9, Hydrogen 5.1, Oxygen (with nitrogen) 7.0.

4. *Cannel or Gas Coals.*—These coals, at least in normal specimens, do not fuse or "cake" in the fire. They give off a large amount of volatile matter, frequently more than half their weight; hence their

popular name of "gas coals." They soil very slightly, or not at all. The coke obtained from them is sometimes fritted, and partially agglutinated, but never fused into globular, mamillated masses, like that obtained from the caking coals. It varies in amount from 30 to 60, or, in typical specimens, from 55 to 58 per cent. Mean composition (normal cannel): Carbon 80–85, Hydrogen 5.5, Oxygen (with nitrogen) 9–12.5.

5. *Lignites or Brown Coals.*—These coals of Tertiary age, differ greatly from one another in external aspect. Some of the so-called jets—passing into the cannel coals—are black, lustrous, and non-soiling; whilst other varieties are brown, and of a ligniform or stratified structure; or, otherwise, earthy and loosely coherent. All, however, are partially soluble in caustic potash, communicating to it a dark brown colour. The coke—usually of a dull charcoal-like aspect, or in sharp-edged fragments retaining their original form—varies from 25 to 50 per cent. Its separate fragments are rarely agglutinated, except in the case of certain varieties (as the lignites of Cuba, and those from the fresh-water deposits of the Basse Alpes in France) which contain asphaltum. All the typical varieties of lignite, as pointed out by Cordier, continue to burn for some time, in the manner of "braise" or ignited wood, after the cessation of the flame occasioned by the combustion of their more volatile constituents; whereas with ordinary coal, ignition ceases on the flame going out. The mean composition of lignite may be represented by—Carbon 65–75; Hydrogen 5, Oxygen (with nitrogen) 20–30.

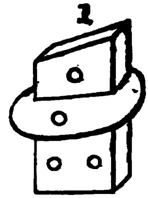
All the different kinds of coal, enumerated above, contain a variable amount of moisture, and of inorganic matter or "ash." The moisture rarely exceeds 3 or 4 per cent., although in some samples of coal it is as high as 6 or 7, and even reaches 15 or 20 per cent. in certain lignites. The amount of ash is also necessarily a variable element. In good coals it is under 5, frequently indeed, under 2 per cent. On the other hand, it sometimes exceeds 8 or 10, and in bad samples even 15 or 20 per cent. The ash may be either argillaceous, argillo-ferruginous, calcareous, or calcareo-ferruginous. The ferruginous ashes are always more or less red or tawny in color from the presence of sesqui-oxide of iron, derived from the iron pyrites ($Fe\,S^2$) originally present in the coal. If much pyrites be present, the coal is not available for furnace operations, gas making, engine use, &c., owing to the injurious effects of the disengaged sulphur. Calcareous ashes are more common in Secondary and Tertiary coals than in those of the Palæozoic Age. For

methods of ascertaining the nature and amount of ash, pyrites, &c., see under § 3 below.

§ 2. INSTRUMENTS AND APPLIANCES.

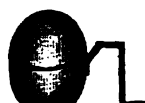
The instruments, &c., employed in these examinations are the following: a blowpipe, blowpipe-lamp, and small spirit-lamp of the ordinary construction; together with the usual accessory instruments and re-agents which always accompany the blowpipe. These require no special description. The blowpipe may be of any form, but for the purpose of heating small platinum vessels in these experiments, it is convenient (although not absolutely necessary) to add to it an extra jet with an orifice rather larger than usual. The blowpipe-lamp should also be furnished with a broad wick-holder of the pattern recommended by Plattner (fig. 1), in place of the flat wick-holders formerly in use. In heating crucibles it is advisable to turn the wick-holder so as to make the upper surface slope towards the right hand instead of towards the left, the flame being then directed upwards, against and around the bottom of the crucible. Or, to avoid the trouble of changing the position of the wick-holder, the operator may turn the lamp itself, placing it with its fore part away from him.

1



In addition to the above, the following appliances, of more special use, are also needed:—(1). Two platinum capsules as thin as they can be obtained. One about half an inch in diameter, provided with a small ear or handle; and the other of somewhat smaller dimensions, and without any projecting ear. The smaller capsule, reversed, fits into the larger one, the two then constituting a closed vessel. Those which I employ, weigh together less than 42 grains. (2). A small platinum crucible with a lid. I make use of two small but deep platinum spoons; one with, and the other without a handle. The latter must be the larger of the two. Its edges must be bent slightly inwards so as to allow it when reversed to be fitted closely over the smaller spoon, and thus to constitute a lid. The long handle of the spoon crucible should be bent as shewn in figure 2. The object of this is to enable the crucible to retain an upright position when placed on the pan of the balance. The figure shews the exact size and form of the crucible employed by me. Its weight is a little under 36 grs. In some spoons a slight notch must be cut in the lid to admit the passing of the handle. (3). A pair of steel tongs or forceps to hold

2



3

the platinum vessel during ignition. These tongs should be so constructed as to remain closed except when subjected to the pressure of the fingers. I give a figure of the kind that I employ, because it is much more convenient than the forceps commonly put up in blowpipe cases; or indeed, than any that I have found described in works on the blowpipe, or in the catalogues of the instrument makers. In using these tongs, the left hand need only be employed. They open by the pressure of the forefinger and thumb upon their sides. (4). A balance. The most convenient kind of balance for use in these operations, is that first contrived by Lingke of Freiburg, for Plattner's assaying experiments. It is figured and described in detail in the fourth edition of Plattner's "*Probirkunst mit dem Löthrohre.*" This balance takes to pieces, and packs with its weights, forceps, &c., into receptacles cut for it in a small box of pear-tree wood, the size of a thin octavo volume. It can be fitted up ready for use, in the course of a few minutes; and its delicacy is very great. That which I employ, when loaded with three grammes, a greater weight than it is ever required to carry, turns readily with less than half a milligramme, or the 0.0077th of a grain. It is convenient to have counterpoises for the platinum vessels described above, as the weights belonging to the balance only range from a gramme downwards. A small platinum capsule forms the best kind of counterpoise. It can be trimmed down by a knife or pair of scissors, until brought, after repeated trials, to the proper weight. In spare places in the box containing the balance that I use, I have cut out receptacles for the two platinum vessels and their counterpoises, and I recommend other operators to do the same; because these platinum vessels are of frequent use in various experiments unconnected with the present inquiry: as in ascertaining the amount of water in minerals, and so forth.

§ 3. Operations.

In the examination of Coals, the following operations are necessary: (1.) The estimation of the water or hygrometric moisture present in the coal; (2.) The estimation and examination of the coke yielded by the coal; (3.) The estimation and examination of the ash or inorganic matters present in the coal; and (4.) The estimation of the sulphur, chiefly contained in the coal as $Fe S^2$.

To these might be added, the determination of the heating powers of the coal; but this operation, at all times one of more or less uncertainty, cannot be performed by the blowpipe in a satisfactory manner. This, however, is really of little consequence, as apart from the doubtful character of the experiment even when conducted on the large scale, the relative heating powers of different samples of coal may generally be estimated sufficiently near for practical purposes by a comparison of the amount of coke, ash, and moisture. The litharge test commonly resorted to for the determination of the calorific power of coals, when properly considered, is of very little actual value. Take, for example, the respective results furnished by good wood-charcoal and ordinary coke. These results are closely alike or rather in favour of the charcoal; and yet experience abundantly proves the stronger heating powers of the coke. It is impossible to raise the temperature of a furnace with charcoal to anything like the same degree as that obtainable by the employment of coke. Besides which, in practice, it is not as a general rule, the absolute calorific powers of a coal that constitute its availability for ordinary operations, because a coal—such, for instance, as a brown coal rich in bitumen—may possess heating powers of considerable amount, but only of short duration: and in cases of this kind, the litharge test becomes again unsatisfactory. Thus the lignites of the department of the Basse Alpes, already alluded to, yield with litharge from 25 to 26 of lead; whilst many caking coals, practically of much higher heating powers, yield scarcely a greater amount. For these reasons, whilst seeking to discover a satisfactory method of ascertaining directly by the blowpipe the heating power of coals, I leave the subject out of consideration in the present paper.

Estimation of Moisture:—This operation is one of extreme simplicity. Some slight care, however, is required, to prevent other volatile matters from being driven off during the expulsion of the hygrometric moisture. Seven or eight small particles, weighing together from 100 to 150 milligrammes, are to be detached from the assay-specimen by means of the cutting pliers, and carefully weighed. They are then to be transferred to a porcelain capsule with thick bottom, and strongly heated for four or five minutes on the support attached to the blowpipe lamp: the unaided flame of the lamp being alone employed for this purpose. It is advisable to place in the capsule at the same time, a small strip of filtering or white blotting paper, the charring of which will give indications of the temperature becoming too high. The coal, whilst still warm, is then to be transferred to the little brass

capsule in which the weighings are performed, and its weight ascertained. In transferring the coal from one vessel to the other, the larger pieces should be removed by a pair of fine brass forceps, and the little particles or dust afterwards swept into the weighing capsule by means of the camel's-hair pencil or small colour-brush belonging to the balance case. The weighing capsule should also be placed in the centre of a half-sheet of glazed writing paper, to prevent the risk of any accidental loss during the transference. After the weighing, the operation must always be repeated to ensure that no further loss of weight occur. In place of the blowpipe-lamp, the spirit-lamp may be employed for this operation, but with the former, there is less danger of the heat becoming too high. By holding a slip of glass for an instant, every now and then, over the capsule, it will soon be seen when the moisture ceases to be given off. It should be remarked, that some anthracites decrepitate slightly when thus treated, in which case the porcelain capsule must be covered with a small watch-glass.

Estimation, &c., of Coke:—In this operation, the small crucible is employed. Particles are detached from the assay specimen as before, by the cutting pliers, and about 100 or 150 milligrammes taken for the experiment. The weighing is performed in the crucible itself, this being placed in the little weighing-capsule, with its handle-support projecting over the side. The crucible, with its cover on, is then brought gradually before the blowpipe to a red heat. The escaping gases will take fire and burn for a few seconds on the outside of the vessel, and a small amount of carbonaceous matter may be deposited upon the cover. This, however, rapidly burns off on the heat being continued; and as soon as it disappears, the crucible is to be withdrawn from the flame, cooled quickly, and weighed always with its cover on. The loss, minus the weight of moisture as ascertained in a previous experiment, gives the amount of volatile or gaseous matter. The residue is the coke and its contained ash. The coke should be examined by a magnifying glass, and its general aspect and characters noted down. As already explained, some coals yield a swollen, semi-fused, and agglutinated coke, with a mamillated surface and metalloidal aspect. Others produce a slightly fritted and partially agglutinated coke; others again, an unfused coke retaining the form of the coal fragments subjected to the assay; others, a pulverulent, or a strongly-soiling coke, and so on. It is sometimes desirable to take the specific gravity of the coke.

Estimation of Ash:—The platinum capsule is employed for this operation. The coal must be reduced to a coarse powder, and about

150 milligrammes weighed out for the experiment. The weighing may be effected in the platinum capsule in which the experiment is to be performed. The weight ascertained, the platinum capsule is to be fixed in an inclined position above the spirit-lamp, and heated as strongly as possible. If the wick of the spirit-lamp be pulled up sufficiently, and a very thin capsule, as already directed, be employed, a temperature sufficiently high to burn off the carbon from most coals is in this manner attainable. The lid of the capsule must be placed above the coal-powder until combustion cease, that is to say, until the gaseous products be driven off, and only the uninflammable carbon and ash remain: as, otherwise, a portion of the powder might very easily be lost. Some of the anthracites, also, decrepitate on the first application of the flame; but even if decrepitation rarely ensue when the coal is in the form of powder, it is still advisable in all cases to keep the assay covered until the flame cease. During the after combustion, the powder or small particles must be gently stirred and carefully turned over, and if agglutinated, broken down by a light steel spatula, or, better still, by a small spatula of platinum, made by inserting a strip of stout platinum foil (an inch long) into one of the ivory or wooden handles intended to hold platinum spoons. These handles are quite useless for the latter purpose, or at least are far inferior to the steel forceps described above. With the forceps, for example, the spoons can be taken up and disengaged in an instant, and without the intervention of the right hand. Whilst the spoons also, are still red hot, the forceps may be laid down without the spoons coming in contact with the table. Figure 4 shews the form and size of the spatula that I employ. *A* is the ivory handle; *C* the piece of stout platinum foil fitting into a slit in A; and *B* the metal ring which keeps the two together. The platinum, it should be remarked, must be sufficiently stout to resist bending; and its point must be kept quite bright and smooth by occasional polishing on a smooth part of the agate mortar which always accompanies the blowpipe. If by the method of procedure just described, the carbonaceous matter be not finally burnt off, the flame of the blowpipe—using the oil-lamp, or spirit-lamp with the wick well up—may be employed to accelerate the process. The operator, however, must be careful to keep the capsule inclined away from the flame, in order to avoid the loss of

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any portion of the fine light ash. Finally, when the ash ceases to exhibit in any of its parts a black colour, the lid of the capsule is to be cautiously replaced, and the whole cooled and weighed.*

Nature of the Ash:—As already remarked, the ash or inorganic portion of the coal, may be either argillaceous—consisting, in that case, essentially of a sub-silicate of alumina—or calcareous; and in either case, ferruginous also. If free from iron, the ash will be white or pale grey; but if iron be present, it will exhibit a yellowish, brown, or red colour, according to the amount of iron contained in it. The iron is, of course, in the state of sesqui-oxide, derived, except perhaps in a few rare instances, entirely from the iron pyrites or bi-sulphide of iron originally present in the coal. I have found, from numerous trials, that the well known salt of phosphorus test, so useful in general cases for the detection of siliceous compounds, cannot be safely resorted to for the purpose of distinguishing the nature of the coal ash obtained in these experiments. This is owing to the small quantity of ash, and to the extremely fine state of division in which it is obtained. Argillaceous ashes dissolve in salt of phosphorus with as much facility as as those of a calcareous nature, and without producing the characteristic silica-skeleton, or causing the opalization of the glass. With calcareous ashes also, the amount obtained is never sufficient to saturate even an exceedingly minute bead of borax or salt of phosphorus, and hence no opacity is obtained by the flaming process. The one kind of ash may be distinguished, however, from the other, by moistening it, and placing the moistened mass on a piece of reddened litmus paper. Calcareous ashes always contain a certain amount of caustic lime, and thus restore the blue colour of the paper. These calcareous ashes also, sometimes contain sulphate of lime.† For the detection of the latter, the following well known test may be resorted to. The ash is to be fused with carb. soda and a little borax on charcoal in a reducing flame, and the fused mass, thus obtained, is to be moistened and placed on a bright silver coin, or on a piece of glazed card: when, if sulphate of lime were present in the ash, a brown or black stain will be produced by the formation of sulphide of silver or of lead. In testing earthy sulphates generally by this process, a little borax should always be

* If the ash be very ferruginous, the results thus obtained, to be exact, will require correction: the original iron-pyrites of the coal being weighed as sesqui-oxide of iron. In ordinary cases, however,—*id est*, in assays as distinguished from analyses, this may be fairly neglected.

When also, the ash is calcareous, and in considerable quantity, it should be moistened with a drop of a solution of carbonate of ammonia, and gently re-heated, previous to weighing.

† The ashes of a lignite from Grosspreisen yielded Erdmann:—Carbonate of lime 30.93, sulphate of lime 36.42, lime 17.22, sesqui-oxide of iron 20.67, alumina 1.23, soda 1.86, potash 1.67.

added to the carbonate of soda, in order to promote the solution of the assay, and the more ready formation of an alkaline sulphide. If oxide of manganese be present in the ash, by fusion with carbonate of soda and a little borax, we obtain the well known bluish-green manganate of soda, technically termed a turquoise-enamel.

Estimation of Sulphur:—The method of detecting the presence of sulphur in coal, is the same as that just pointed out for the detection of sulphate of lime in the ash. The actual estimation of the sulphur is a much more troublesome operation. A process given by Berthier, in his *Traité des Essais par la voie sèche*, consists in boiling the ferruginous ash in hydrochloric acid, which dissolves out the sesqui-oxide of iron, and then calculating the sulphur from the loss. One hundred parts, for example, of sesqui-oxide of iron correspond to 70.03 of metallic iron; and hence to 150.24 of iron pyrites, or to 80.21 of sulphur. But this method, besides requiring a larger quantity of ash than can be conveniently prepared in these blowpipe examinations, exacts that the other portion of the ash be not attackable by the acid, a condition which of course does not obtain in the case of calcareous ashes. For this reason, the process recommended by Rose and other chemists is preferable, although somewhat beyond the range of blowpipe examinations. About 200 milligrammes of the coal in fine powder are to be intimately mixed with 8 parts of nitrate of potash, 4 of carbonate of potash, and 16 of common salt, and the mixture fused in a platinum crucible over the spirit-lamp, with the wick well pulled up, or, better still, over a double current or Berzeliu's lamp. The fused mass is then to be dissolved out in boiling water, to which a few drops of hydrochloric acid have been added, and the sulphuric acid thrown down by chloride of barium. By dividing the precipitate thus obtained (after filtration, careful washing, and ignition,) by 7.25, we get the amount of sulphur.

As the above process, although simple enough in the performance, is scarcely available when the operator is away from home, I have attempted to hit upon a more ready method, and one more properly within the legitimate pale of blowpipe experimentation, of ascertaining approximatively the amount of sulphur in coal samples. After various trials, I have found the following process sufficiently exact for all ordinary cases, because, as a general rule, we merely require to know here, if the coal under examination be slightly, moderately, or highly sulphurous. It consists essentially in comparing the intensity of the stain produced on silver foil by an alkaline sulphide of known composition, with that formed by an alkaline sulphide obtained from the assay-coal. For this purpose, mixtures must first be made of a

coal free from sulphur, with such proportions of iron pyrites as correspond respectively to a per centage of 2, 4, 6, 8, and 10 parts of sulphur. These proportions are the following: Coal 96.26, pyrites 3.74= sulphur 2 per cent. Coal 92.50, pyrites 7.50=sulphur 4 per cent. Coal 88.76, pyrites 11.24=sulphur 6 per cent. Coal 85, pyrites 15= sulphur 8 per cent. Coal 81.27, pyrites 18.73=sulphur 10 per cent. Separate portions of each of these mixtures are to be fused in a platinum spoon with three parts of a mixture of five parts of carbonate of soda with one part of borax (mixed beforehand, and kept for these experiments in a receptacle of its own); and the fused mass is then to be dissolved out in a measured quantity of water. A single drop of the solution is afterwards to be placed on a piece of silver foil (formed for example by beating out a small coin), and suffered to remain upon it for thirty seconds. The silver, wiped dry, is finally to be marked on the back with the per centage of sulphur—2, 4, &c.—contained in the prepared coal. When employing this method for the estimation of sulphur, the coal under examination is to be treated in an exactly similar manner, and the stain produced by it on a piece of clean foil, compared with the test-stains on the separate silver plates.

Finally, when the iron pyrites in the coal is not in a state of semi-decomposition, the amount of pyrites, and consequently the amount of sulphur, may be arrived at far more nearly than might at first thought be supposed, by the simple process of washing in the agate mortar. Each single part of pyrites, it will be remembered, corresponds to 0.53 of sulphur. A large piece of the assay-coal should be taken, and broken up into powder; and a couple of trials should be made on separate portions of this. About 500 milligrammes may be taken for each trial, and washed in three or four portions. In the hands of one accustomed to the use of the mortar in reducing experiments, the results, owing to the lightness of the coal particles, and the consequent ease with which they are floated off, come out surprisingly near to the truth. In travelling, we may dispense with the washing bottle, by employing, in its place, a piece of straight tubing drawn out abruptly to a point. This is to be filled by suction, and the water expelled with the necessary force by blowing down the tube. A tube six inches long and the fourth of an inch in diameter will hold more than a sufficient quantity of water to be used between the separate grindings. The mortar should be very slightly inclined, and the stream of water must not be too strong, otherwise, and especially if the coal be ground up too fine, portions of the iron pyrites may be lost. The proper manipulation, however, is easily acquired by a little practice.

NOTES ON LATIN INSCRIPTIONS FOUND IN BRITAIN.

PART II.*

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Read before the Canadian Institute, 30th January, 1858.

(4.) In article 3 of the preceding part, I cited an inscription on an altar found at Birrens, with the object of establishing the correct reading of the *nomen* of a Præfect of the second Cohort of the Tungrians. As doubts, however, exist, relative to the interpretation of parts of this inscription, I now propose directing special attention to it.

MARTI ET VICTO
RIAE· AVG· C· RAE
TIMILIT· IN COH
II TVNGR· CVI·
PRAEEST SILVIVS
AVSPEX· PRÆF·
V S L M

Dr. Wilson (Preh. Ann., p. 398) figures the altar, and renders the inscription thus:—"MARTI ET VICTORIÆ AVGVSTÆ CENTVRIÆ TIRONVM MILITVM IN COHORTE SECVNDA TVNGRORVM, CVI PRÆEST SILVIVS AVSPEX, VOTVM SOLVERVNT LVBENTES MERITO."

In the "Caledonia Romana," 2nd Ed., by Prof. Thomson, p. 128, we have the following translation of this rendering:

"To Mars and Victory, the Companies Augustæ of young soldiers in the second cohort of the Tungrians, commanded by Silvius Auspex, Præfect, most willingly have performed their vow."

As this interpretation is evidently unsatisfactory, Prof. Thomson suggests that "The letters C· RAETI probably refer to 100 Raeti, that is, soldiers drawn from the North of Italy and South East of Germany;

* Since the publication of Part I. I have noticed an inscription, (Marini, Atti degli Arvali i, 212,) which favours my suggestion in Art. 1., that *deliota a medicis* was used for *derelicta a medicis*:

FELIX· PVBLICVS
ASINIANVS· PONTIFIC
BONAE· DEAE· AGRESTI FELIC
VOTVM· SOLVIT· IVNICEM· ALBA
LIBENS· ANIMO OB LVMINIBVS (sic)
RESTITVTIS· DERELICTVS· A MEDICIS POST
MENSES DECIM BENEFICIO DOMINAES MEDICINIS SANATVS PER
EAM RESTITVTA OMNIA MINISTERIO CARNIÆ FORTVNATÆ.

Vide also Orelli, n. 1518.

if so, the term Augustæ must be taken as an epithet of the Goddess Victory."

Mr. C. Roach Smith (Collect. Antiq. III. iv., p. 203):—"suggests the following reading, emending that given by Dr. Wilson only as regards the name of the person who erected the altar: *Marti et Victoriæ Augustæ C. Raetius militaris in cohorte secunda Tungrorum cui præest Silvius Auspex Præfectus votum solvit lubens merito.*"—but this reading of C. RAETI MILIT. seems to be very improbable.

AVG—for AVGVSTÆ—should unquestionably be joined with VICTORIÆ, as there are numerous similar examples; C I regard as standing for CIVES, as it is frequently used in inscriptions; Prof. Thomson's suggestion, in my judgment, gives the true reading, RAETI, the ethnic adjective of RAETIA: and MILIT is the ordinary abbreviation of MILITANTES. From this and a preceding inscription relative to the Tungrians, we learn that in addition to their own countrymen, Vellavians and citizens of Raetia were serving in their ranks. This is as might be expected, and agrees with the inference, which may be drawn from many sepulchral inscriptions, that the soldiers in the auxiliary wings or cohorts were sometimes of nations different from that which gave name to the wing or cohort. Vide Henzen, Annall. Inst. Arch. 1850, and Orell. Inscrip. n. 6838.

(5.) The following inscription, mentioning the same Præfect, is on an altar, also found at Birrens:

DEAE
MINERVAE
COH II TVN
GRORVM
MIL EQ CL
CVI PRAEEST CS L
AVSPEX PRAEF.

Dr. Wilson (Preh. Ann. p. 397) renders it thus:—DEÆ MINERVÆ, COHORTIS SECVNDÆ TVNGRORVM MILITIA EQVESTRIS CONSTANTINI LEGIONIS, CVI PRÆEST CAIVS LVCIVS AVSPEX PRÆFECTVS.

In the "Caledonia Romana," 2nd Ed., by Prof. Thomson, p. 129, we find the following translation of this rendering:—"'*To the Goddess Minerva, the Cavalry of the Second Cohort of Tungrians of the Constantine legion, commanded by Caius Lucius Auspex Præfect.*' The cohort was the tenth part of a legion, and hence the apparent *transposition* in this translation."

There are so many obvious objections to this interpretation, that it is plain that it cannot be received. COH II TVNGRORVM evidently

stand for COHORS SECVNDA TVNGRORVM, and indicate that the altar was erected by the cohort V·S·L·M· or the verb *posuit, dedicavit,* or some similar term being omitted, as is of frequent occurrence. MIL EQ are for *Milliaria Equitata,* the well known designations of a cohort in which there were a thousand men, of whom a portion were cavalry. From Hyginus *de Castrametatione* (vide Græv. Antiq. X. 1093) we learn, that in such a cohort there were 760 infantry and 240 cavalry soldiers. COHORS SECVNDA TVNGRORVM was a cohort of this description, as appears from other inscriptions e. gr. the following given by Dr. Bruce (Roman Wall, p. 264.)—

IOM
COH $\overline{\text{II}}$· TVNGR
* ∞ EQ·C·L·CVI
PRAEEST·ALB
SEVERVS PR
AEF· TVNG· IN
STA· VIC· SEVRO
PRINCIPI.

So far there is no doubt as to the true interpretation of the inscription, but the letters C·L· present no ordinary difficulty. In Camden's Britannia, ed. Gough, III, p. 457, we find reference to a discussion by Professor Ward of the meaning of these letters, as they were applied to the same cohort on another altar found at Castlesteeds. Prof. Ward was of opinion that they were numerals, standing for 150, and supports this opinion by arguments, from which it is plain that he was not aware of the difference between auxiliary and legionary cohorts. Mr. Hodgson, (vide Bruce's Roman Wall, p. 264,) "after a careful and learned examination of [the inscription already cited] and kindred inscriptions" regards the letters C·L· as used for *Civium Latinorum.* Henzen (Orell. Inscrip.nn.6780 and 6781) boldly removes the difficulty by substituting R as a correction for L—*i.e.* he reads, C·R· the well-known representatives of *Civium Romanorum.* This might be admitted as a satisfactory solution, if the letters C. L. had been found on but one stone, but as there are at least four altars on which these letters appear in the same connexion, Henzen's assumption of a mistake is highly improbable. Mr. Hodgson's interpretation is certainly preferable to either of the others. It is liable, however, to the objection that, so far as I am aware, there is no certain example of this use of the letters C. L. in any other inscription.

* This represents the ordinary symbol for 1000.

The only other point which deserves attention, is the name of the Præfect, CS L AVSPEX. Instead of the reading which has been proposed, *Caius Lucius Auspex*, I should suggest that I between S and L has been overlooked, that SIL is an abreviation of SILVIVS, and that the full names of the officer mentioned in this and the other inscriptions, were *Caius Silvius Auspex*.

According to my views, the inscription may be translated thus:

"To the goddess Minerva, the second cohort of the Tungrians, a thousand strong, furnished with cavalry, consisting of Latin citizens, under the command of Caius Silvius Auspex, Præfect,"—have erected this altar.

6. In December, 1854, two coffins, evidently of the Roman period, were found at Combe Down, near Bath. One of these was partly covered by a stone bearing the following inscriptions:

PRO SALVTE IMP· CES· M· AVR
ANTONINI PII FELICIS INVIC
TI AVG .. NAEVIVS AVG
LIB ADIVT PROCC PR.. I
PIA RVINA OPRESS·A SOLO RES
TITVIT.

Mr. Hunter (Archæological Journal, March, 1855,) supplies M after I in the 4th line and gives the following explanation:

"For the safety,—or whatever *salus* in this connection, where we forever find it, may mean,—of the Emperor Cæsar Marcus Aurelius Antoninus Pius, happy, invincible (or unconquered) Augustus, (supply a prenomen where the stone is damaged, probably one represented by two letters, as CN.) Nævius, a freed man of Augustus, the adjutor of the procurators, (then comes the doubtful word, which perhaps may be PROVINCIE,) restored from its foundations, (this building, temple, or whatever it was, for the edifice was there to speak for itself,) when it had been thrown down by an impious act of ruination.

"Another reading of the doubtful word may be PRIMARIVS, and I think some one suggested PRETORIVM. I fear the word is too far gone for any one to venture to pronounce conclusively what the reading of it is.

"A question arising upon this inscription is, which of the emperors calling themselves Antoninus, it commemorates. It is a question of about fifty years, A. C. 180–230. On a first view one would refer it to Marcus Aurelius, the immediate successor of Antoninus Pius, the first of the Antonines, and I see not why it should not belong to his reign, unless it can be shown (a point I have not examined) that his name is never found in inscriptions with the additions Felix and Invictus. If it shall appear that his name does not occur with these additions, then undoubtedly it may be assigned to the three years' reign of Heliogabalus, or to any intermediate emperor who called himself Antoninus, and who is known to have used those additions. But at present I see no improbability in assignin it to the emperor so well known by his name of Marcus Aurelius."

Mr. Hunter here offers a conjecture that *impia* may refer to 'some religious or political ferment,' and cites in illustration the words *locum religiosum per insolentiam erutum*, found in another of the Bath inscriptions.

"Nævius the Adjutor, a Roman officer, to whose duties sufficient attention seems hardly to have been paid by the writers on Roman antiquities, may seem to have been the proper officer to superintend this re-edification.

"His name, I believe, is not found in any other inscription discovered in England. But in Gruter, civ., No. 9, we have—P. Nævius, Adjutor, in an inscription found at Tarracona. We find also, in Gruter ccclxxi., No. 8, Adjutore Procc. Civitatis Senonum Tricassinorum Meldorum &c., which shows that the Adjutor to the Procurators is not an officer unknown to inscriptions."

In the same number of the Journal, we have also Dr. Bruce's observations:

As far as my present knowledge goes, I am disposed to expand the inscription thus:—

Pro salute Imperatoris Cæsaris Marci Aureii Antonini Pii Felicis Invicti Augusti ....Nævius Augusti libertus adjutor Procuratorum principia ruina oppressa a solo restituit.

"It may be translated in something like this form:—For the safety of the Emperor Cæsar Marcus Aurelius Antoninus, the pious, fortunate and invincible Augustus....Nævius, the freedman of Augustus and the assistant of the Procurators restored these chief military quarters, which had fallen to ruin.

"The first question that arises here is respecting the emperor, specially addressed. I find that the names and epithets used in this inscription are in others applied both to Caracalla and Heliogabalus, with the exception of the word *invictus;* and in no other instance that I can find is this applied to either of these emperors. I incline to Mr. Franks' opinion, that Heliogabalus is the person here intended, for the following reasons:—1. On the murder of Heliogabalus his name seems to have been erased from inscriptions, or the slabs themselves thrown down. This stone having been used to cover a tomb must have previously been removed from its original position. 2. From the indistinctness of some of the letters, I take it for granted that the inscription is not deeply carved; this, together with the omission of the A in Cesaris, and the occurrence of tied letters, seems to indicate the later rather than the earlier period. 3. Had Caracalla been the person intended, one of his well known epithets, such as *Parthicus*, *Britannicus* or *Germanicus*, would probably have occupied the place of *invictus;* so far as I have noticed. Heliogabalus had earned no such distinctions; his flatterers, therefore, on his assuming the purple, would have no resource but to bestow upon him the indefinite title of *invictus*.

"The next thing which occurs in it is the name of the dedicator. Mr. Hunter remarked that the name NAEVIVS occurred in Gruter. It is not without interest to observe, that one of the examples furnished by that author (P. civ., No. 9,) contains that name with the epithet *adjutor* appended.

TVTELÆ
V. S.
P. NAEVIVS
ADIVTOR.

"The Nævius of the slab found at Bath was a freedman of Augustus, and an assistant or secretary of the procurators of the province. We are not without an authority for the reading *Adjutor Procuratorum*. In Gruter (P. ccclxxi, No. 8) the following occurs:

....MEMORIÆ AVRELI
DEMETRI ADIVTORI
PROCC.................

"The word which I conceive to be *principia* presents the greatest difficulty. It appears that the stone is damaged in this part. We are necessarily driven to conjecture in order to supply the vacuity between the N and the I at the end of the fourth line. The inscription speaks of the restoration of something which had become ruinous. If I correctly read the other parts of the inscription which seem to be quite plain, this is the only word left to reveal to us the precise object of the dedicator's exertions. In the station at Lanchester, a slab has been found (Horsley, Durham, No. xii.), containing on its third and fourth lines the following words:

PRINCIPIA ET ARMAMEN
TARIA CONLAPSA RESTITVIT.

Here we have evidence that there was a class of buildings called *principia*, which, like other buildings, would fall into ruin and require restoration. This word seems best to suit the damaged part of the inscription before us. The only letters that we require to draw upon the imagination for are the first I in the word, which has probably been attached to the top of the left limb of the N, and the C, for which there is sufficient room on that injured part of the stone between the N. and the I. Perhaps the word *principia* might be translated officers' barracks. The remainder of the inscription requires no remarks."

In the number for June, 1855, Mr. Franks states the grounds of his conviction that the tablet should be assigned to the reign of Elagabalus:

"The inscription can only apply to Caracalla or Elagabalus, but it does not appear that the epithet *Invictus* was given to the former. There are, however, coins of Elagabalus on which he is thus styled. The inscription may have suffered mutilation in a slight degree, and the popular indignation, which defaced or destroyed the memorials of the Emperor, may possibly account for the occurrence of this tablet used as a part of the cover of a sepulchral cist."

The Rev. H. M. Scarth, by whom the stone was purchased and presented to the Bath Institution, communicated a very interesting paper on the subject to the Somersetshire Archæological and Natural History Society, in which he gives full particulars of the discovery of the coffins and expresses his assent to Dr. Bruce's interpretation of the inscription.

The only difficulties in the text of the inscription relate to the prænomen of *Nævius*, and the word or words between PROCC and

RVINA. As to the first it is of but little moment and can never be determined with certainty or probability. It may have been *Publius*, as in Gruter, civ. 9, but it must be borne in mind that in that inscription ADIVTOR is more probably a cognomen and not the designation of an Office.

With reference to the word or words between PROCC and RVINA, Dr. Bruce's citation of the inscription given by Horsley, (Durham, n. xii.) seems to remove all doubts on the point. I do not, however, feel quite satisfied with the interpretation of the word *principia*, as "chief military quarters" or "officers' barracks;" or of *ruina oppressa*, as "which had fallen into ruin."

The latter expression, (which is so rare that I have been unable to find any other example in inscriptions,) seems to me to indicate that the *principia*, whatever they were, were destroyed by the falling of something else,—either the building of which they formed a part, or some adjacent edifice. It is certainly in this sense that the words are used by Cicero, *de Oratore*, ii, 86. "*ea* ruina *ipsum* oppressum *cum suis periise*.

The ordinary form of expression, which is found in inscriptions, relating to the falling of buildings, is *vetustate collapsum*. In Steiner, Cod. Inscrip. Rom. Rhen. n. 852, we find the following variety, approaching that in the text:—

DIS. CONSER
VATORIBVS. Q· TAR
QVITIVS. CATVL
VS· LEG· AVG·
CVIVS· CVRA· PRAETOR
IVM· IN· RVINAM
CONLAPSVM· AD· NO
VAM· FACIEM·
RESTITVTVM.

But the principal and most interesting question relates to the emperor, whose names and titles are given.

As there were three emperors, each of whom was commonly known as *Marcus Aurelius Antoninus Pius*, our only hope of determining to which of them we should refer the inscription, is in the other epithets *Felix* and *Invictus*. Now there is satisfactory evidence that Commodus was the first Roman emperor to whom the epithet *felix* was given, and consequently the question is limited to Caracalla and Elagabalus.*

* There are one or two inscriptions, in which Commodus is styled *M. Aurelius Antoninus Pius Aug. Felix*, and *Invictus*, but, however, the question in the present case seems to be properly limited to Caracalla and Elagabalus.

That the epithet *invictus* was applied to the first of these cannot be questioned, as the following examples leave no doubt on the subject.

IIII.

IMP· CAESAR
M· AVRELIVS ANTONINVS
INVICTVS· PIVS· FELIX· AVG.
PART· MAX· BRIT· MAX· GERM
MAX· PONT. MAX· TRIB· POTES[T]
XVIIII· IMP· III· COS· IIII· PROCOS
VIAM· ANTE· HAC· LAPIDE[I]AM
INVTILITER· STRATAM· ET
CORRVPTAM· SILICE· NOVO
QVO· FIRMIOR· COMMEANTIBVS
ESSET· PER· MILIA· [PAS]
SVM· XXI· SVA· PECVNIA FECIT
LXXI.

(Monmsen, Inscrip. Regni. Neapol. Lat. p. 354.)

IMP· CAES· M· AVRELIO
ANTONINO· PIO· FELICI
INVICTO· AVG· PARTH
MAX· BRITANN· MAX
PONT· MAX· TRIB· POT· XVI
IMP· II· COS· IV· P. P· PROCOS
DOMINO
INDVLGENTISSIMO
NEGOTIANTES
VASCVLARI
CONSERVATORI· SVO
NVMINI· EIVS
DEVOTI.

(Henzen, Orell. Inscrip. Lat. n. 7262.)

[From Eckhel, VII, 179, we learn that the epithet was also given to him on coins.]

The use of this term in the case of Elagabalus, although probable in consequence of his assumption of other titles of Caracalla,* cannot, so far as I am aware, be established by any inscription clearly belonging to him. But Mr. Franks (Archæological Journal, June, 1855)

* From Dio Cassius, lxxix, 2, we learn that he assumed the titles *Cæsar*, *Augustus*, *Imperator*, *Proconsul*, *Trib. Pot.*, *Ant. Fil.* and *Severi Nep.* From coins, however, we learn that this is not a complete enumeration, he is styled on some of these *Pater Patriæ*.

states, that "there are coins of Elagabalus in which he is thus styled." I am not aware of any such, excepting those noticed by Eckhel, VII, p. 249, and Rasche II, ii, p. 792, as bearing the legend INVICTVS SACERDOS AVG, where *invictus* seems to be applied to him as priest of Sol, of whom that term is a *perpetuum epitheton*.

If we assign the inscription to Caracalla, a question still remains as to the date of it. As there is no mention of either Severus or Geta, it is most probable that it was after the death of both. Now Severus died at York in February, A. D. 211; and Caracalla and Geta left England in the same year, for Rome, where Geta was murdered in February A. D. 212. The limits then are February, 212, and April, 217, when Caracalla himself was murdered. The statement by Eckhel, that *Felix* did not appear on the coins of Caracalla until A. D. 213 suggested to me that year as one of the *cancelli*, but there is unquestionable evidence that *Felix* was amongst his epithets on stones before that date, not only in conjunction with his father, (of which there are well known examples,) but also separately after his accession.

7. In the year 1754 an altar was found in Upper Stall Street, Bath, bearing the following inscription:

PEREGRINVS
SECVNDI FIL
CIVIS·TREVER
IOVCETIO
MARTI ET
NEMETONA
V·S·L·M.

Mr. Gough (Camden's Britannia, i. p. 118) observes, that the altar "was erected by Peregrinus to two new local deities. Jupiter *Cetius* may be the *Ceaicus* or *Ceatius* on an inscription given by Mr. Horsley, 278, in Cumberland, and takes his name from Mount *Cetius* in Noricum, under which was the town of *Cetium*, and Nemetona, one of the many local deities mentioned only in these inscriptions."

Mr. Warner (Hist. of Bath, p. 120, Append.) remarks, that "It is dedicated to three deities, the Cetian Jupiter, Mars, and Nemetona, a local deity. The name of the person who erected it does not appear; for the word *Peregrinus* is merely an appellative, implying that he was a stranger or traveller. We find, however, by the second and third lines, the name of his father *Secundus*: and the city of his residence, Treves in Germany. The last of the deities mentioned in the inscription seems to have been a British one, and known only in the south-western parts of England. The name Nememotacio (which

Baxter considers as synonymous with Nemetomagus) seems in the chorography of Anonymus Ravennas, and is conjectured by Baxter, to be the present Launceston. If this be allowed, the near approach of Nemetona to the town Nemetomagus, will justify the opinion of the former being the local divinity of the latter."

Mr. Scarth (Somersetshire Archæolog. & Nat. His. Soc's Proceedings, 1852, p. 99) mentions the opinions (which have been above stated) relative to Jupiter Cetius and Nemetona, without, however, expressing approval of them, or offering any other explanation.

There can, I think, be but little doubt in the mind of those who have noticed *Marti Leucetio* in Gruter, lviii. 3, that I, the initial letter of the 4th line of the inscription, is a mistake for L, and that we should read the names of the deities

LOVCETIO
MARTI ET
NEMETONA[E]

In Steiner, 1 Dan. et Rh. 1, n. 472 (cited by Henzen, n. 5899, who also proposes this emendation) we have

CVRTELIA·PREPVSA
MARTI·LOVCETIO
V·S·L·L·M

and

MARTI·LEVCETIO
T. TACITVS CENSORINVS*
V·S·L·L·M

The deities are joined in the following inscription, found at Altripp, *prope Nemetas*, and given by Henzen, n. 5904:

MARTI·ET·NEMETO
NAE
SILVIN IVSTVS
ET·DVBITATVS
V·S·L·L·P

Leucetius seems to be derived from *Leuci*, and *Nemetona* from *Nemetes*, both being names of peoples in the neighbourhood of the Treviri.* It is scarcely necessary to add, that there is no foundation for Mr. Warner's assertion, that "*Peregrinus* is merely an appellative." The name often occurs in inscriptions; and it must be borne in mind

* Of these derivations, the latter appears to be certain, but the former doubtful, as we have evidence that Jupiter was called *Leucetius*, as the giver of light. Vide A. Gell. Noct. Att. v. 12; Festus x, i, and Serv. on Virgil, Æn. ix. 570. Another derivation, which has been proposed, from *Leuce*, an island in the Euxine, is very improbable.

that the use of but one name was not uncommon among the Gauls. The meaning of CIVIS TREVER, also, is not "a citizen of Treves," but a Trever citizen, *i. e.* a citizen of the people called Treveri, or Treviri.

ON SOME NEW TRILOBITES FROM CANADIAN ROCKS.

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Read before the Canadian Institute, March 20th, 1858.

I. ON A NEW SPECIES OF ASAPHUS FROM THE LOWER SILURIAN ROCKS OF UPPER CANADA.

§1. *Introductory Notice :*—In the autumn of 1856, I communicated to the "Canadian Journal," under the title of ***Asaphus Canadensis,*** a brief notice of a supposed new trilobite from the Utica Schist (Lower Silurian) of Whitby in Canada West; and in a subsequent number of our Journal, I gave a more detailed description of the form. At the same time, I pointed out that Professor Hall of Albany believed it to be identical with a species founded by him (under the name of ***Asaphus*(?) *latimarginatus***) on two imperfect caudal shields, figured in the first volume of his "Palæontology of New York." At the period in question, I was not in a position, from the want of works of reference and other sources of information, to claim this trilobite as actually new; but an extended investigation having shewn it to be really a distinct form—a view adopted also by others—I now publish a complete description of the species, together with as accurate a figure as I am able to get executed in Canada. In this communication, also, I have attempted to shew, by a brief analysis of all the fairly-established species of the genus ASAPHUS, that our Canadian species is undoubtedly distinct. I should state, with regard to the figures of Professor Hall, alluded to above, that it is impossible to determine whether our species be identical or not with these. In the words of Barrande, in his great work on the Silurian Basin of Bohemia, they are too incomplete to be determined with any certainty.* For this reason, in the Museum of

* Divers fragments d'Amerique nommés *Asaphus* par J. Hall, et figurés dans la Paléontologie de New York, sont trop incomplets pour être surement déterminés. Barrande, Système Silurien du Centre de la Bohême. vol 1, p. 657.

the Geological Survey of Canada, the specific name of *Canadensis*, as originally bestowed on this trilobite by the author, has been retained. Barrande, in the work just cited, alludes to another American trilobite in the possession of M. de Verneuil, but unnamed and unfigured, with which our species may very possibly agree: only, the caudal shield of this specimen would appear to possess no lateral segmentation, and to have a scarcely defined axis, as M. Barrande refers it to the *platycephalus* or *gigas* type.* His statement respecting it is as follows:—"Nous avons vu récemment, dans la belle collection de notre ami M. de Verneuil un *Asaphus* des Etats-Unis, qui, portant à l'angle génal une pointe longue et grêle, constitue une espèce très distincte d'*As.* (*Is.*) *gigas*. Malheureusement, nous ne savons quel est le nom spécifique qui lui a été donné par les savans Americains. Ce trilobite se rangerait dans le group de *A. gigas*, d'après les souvenirs qui nous restent de sa conformation."

§ 2. *Description of Asaphus Canadensis.* This description is based on what is probably the long or male form.

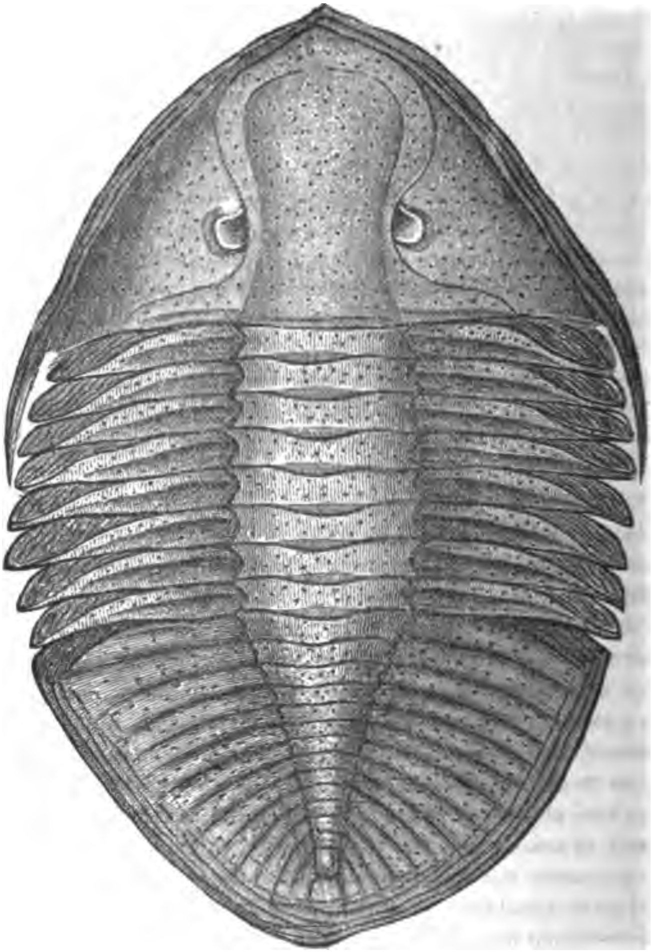
General outline, a broad oval. Vertical to transverse diameter, nearly as 3 : 2. Relative lengths of head-shield, thorax and pygidium, as 1 : 0.88 : 1.1.

Head-shield obtusely pointed anteriorly, much as in *Asaphus platycephalus*. Genal angles terminating in sharply-pointed horns of the Paradoxides type, extending downwards to about the middle of the body.† Facial suture, as shewn in the figure; the branches uniting in an obtuse but clearly defined angle above the glabella, nearly at the extreme anterior margin of the head-shield, and terminating at the lower margin, about midway between the glabella and the genal angles. Glabella, feebly raised, broad, and generally conformable at its upper part to the outline of the facial suture. At its base, there occurs a slight but evident neck-furrow. There are no furrows on the glabella itself. Length of glabella to length of head-shield, as 0.8 : 1.0. Eyes, moderately raised, and delicately reticulated; although, in most specimens they are more or less destroyed. Breadth between the eyes, to extreme breadth of head-shield across them, as 5 : 11. Whole surface of the head-shield covered with fine punctures, except at the striated limb.

Thorax, with eight segments. Axis well defined; narrow, somewhat broader in the middle than at the ends. Mean breadth of axis, to

* It is perhaps the *Asaphus Iowensis* of Dale Owen.

† In most specimens, as in the figure, the horns extend to the bottom of the fourth thoracic segment; but in a small specimen obtained quite recently from Whitby, and kindly submitted to us by Mr. J. F. Smith of Toronto, they reach to about the middle of the sixth pleura. In our figure they do not make a sufficiently sharp angle with the lower border of the head-shield.



ASAPHUS CANADENSIS.

(E. J. Chapman. sp. 1856.)

breadth of each side-lobe, as 5 to 6. Pleuræ, terminating in slight points, and curving slightly downwards*; furrowed to about half their length from the axis, and then crossed obliquely by a curvilinear ridge. A second, but slighter, furrow runs along the lower edge, and two short deep furrows shaped together like the letter V placed upon its side with the point inwards, separate each pleura from its axis-segment. Beyond the ridge the points are delicately striated. Fine punctures occur upon the axis and also on the pleuræ. On the latter the punctures are larger and farther apart; and when examined through a magnifying glass, they appear to be of a semi-lunar form with the convex side turned inwards. They are likewise more deeply indented at the convex side.

Pygidium, oval, with striated limb and well developed, tapering axis. This terminates somewhat abruptly before reaching the end of the pygidium. It contains from 12 to 14 segment-markings, and a similar number are present on the side-lobes. All are destitute of secondary furrows. Those on the side-lobes bend downwards near their extremities, and merge into the striated limb. The lower ones are nearly vertical. The whole surface of the pygidium is covered with fine punctures shaped and arranged exactly like the punctures on the surface of the thorax. *Asaphus platycephalus*, as mentioned by Professor Hall, exhibits in some specimens a delicately punctured surface; but in the present species the punctures appear to be much more striking. Our other new species, *A. Halli*, is also very visibly punctured; although the punctures, as shown in our figures, are too coarse and too far apart.

The only specimens of *Asaphus Canadensis* hitherto obtained, have been procured from the Utica Schist (Lower Silurian) of the Townships of Whitby and Nottawasaga, (localities about eighty miles apart), in Canada West. They occur in association with *Triarthrus Beckii.* In length they appear to vary from about an inch and a half (=38.1 millimetres), to about five inches (=127 millimetres). I have not yet been able to observe the under side, so as to make out the direction of the under sutures, and the form of the hypostoma. An isolated hypostoma, however, found near Whitby, probably belongs to this species. It is badly preserved, but it appears to resemble very closely the hypostoma of *A. platycephalus.*

* In the horned Asaphidæ, and in nearly all the horned trilobites, the pleuræ point downwards, whilst in the forms with rounded genal angles, the pleuræ have almost invariably an upward curve, as in the figure of *A. Halli*, on page 236. When the side-pieces or cheeks of the head-shield are broken off, we may generally determine the nature of the genal angles by this character.

§ 3. *Specific Differences*:—(1.) *Asaphus Canadensis* differs from *A. platycephalus*, Stokes (*Isotelus gigas*, Dekay); *A. expansus*, Linn; *A. Barrandei*, de Verneuil; *A. læviceps*, Dalman; *A.* (*Is.*) *affinis*, McCoy, (including *Is. gigas*, *Is. planus* and *Is. Powisii* of Portlock)—in having, with other opposing characters, the genal angles of the head-shield extended into horns.

(2.) It differs from *A. tyrannus*, Murchison; *A. Powisii*, Murchison; and *A. ingens*, Barrande—in having, with other opposing characters, the branches of the facial suture united above the glabella on the upper surface of the head-shield.

(3.) It differs from *A. nobilis*, Barrande—in wanting the curved furrows on the axis of the pygidium, as exhibited by that species; and also by the greater number of the segment-markings on the side-lobes of its pygidium, as well as by the general outline of the facial suture, and other characters.

(4.) It differs from *A. extenuatus*, Waldheim—by the obtuse outline of its cephalic shield, and by other marked characters.

(5.) It differs from *A.* (*Is*) *laticostatus*, Green—the genal angles of which are unknown—by its thorax being nearly of the same length as its head-shield, and by the greater number of segment markings on the side lobes of its pygidium, as well as by other characters.

(6.) It differs from *A. ovatus*, Portlock, by the presence of segment markings on the side lobes of its pygidium. I am not acquainted with the head-shield of *A. ovatus*, and I cannot obtain here a copy of Colonel Portlock's Report in which the species is figured.

(7.) It differs from *A. angustifrons*, Dalman; and *A. frontalis*, Dalm.; by the greater development of its genal points, Dalman's species being placed by him under his subdivision of "Mutici," comprising the forms with rounded or but slightly pointed genal angles. I am not sufficiently acquainted, however, with these Swedish species to name any other distinguishing characters, and I have no means of procuring here a copy of Dalman's "Palaeden," in which the species are described.

(8.) It differs from *A. Iowensis*, Dale Owen, by its genal points reaching only to the middle instead of to the end of the thorax; by its facial suture being pointed, instead of curved, above the glabella; and by the presence of segment-markings on its pygidium.

The head-shields of *A. grandis*, Sars; *A. Fournetti*, de Verneuil; and *A. latimarginatus*, Hall—are yet unknown.

Finally, apart from the absence of secondary furrows on the pygidium segments, *Asaphus Canadensis* differs from the generally admitted species of Ogygia, by the following characters:

(1.) From *O. Buchii*, Brongniart; and *O.* (?) *Portlockii*, Salter—by the branches of the facial suture being united on the upper part of the head-shield.

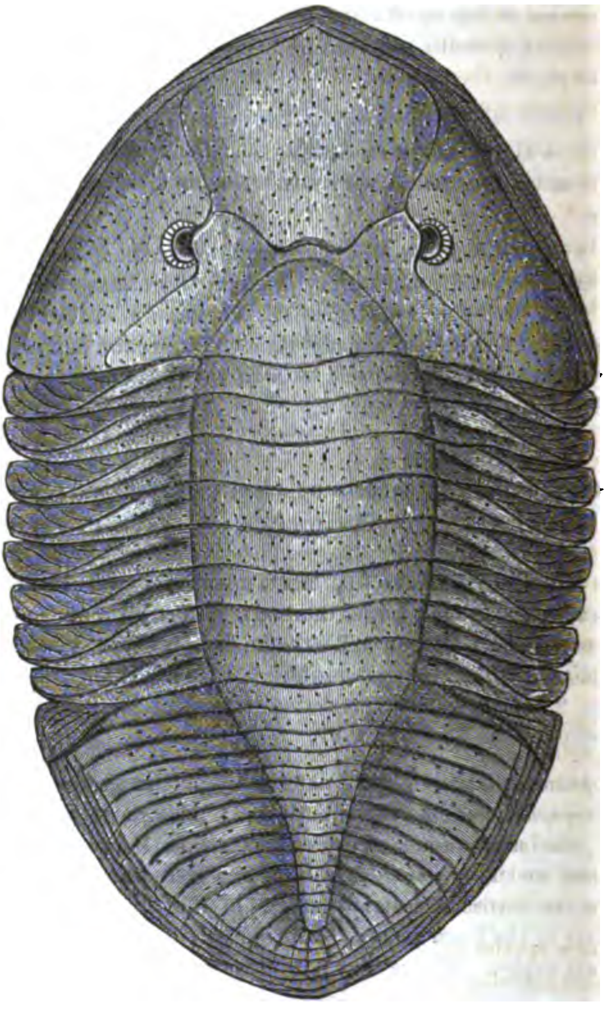
(2.) From *O.* (?) *Guettardi*, Brongniart; *O.* (?) *Desmaresti*, Brong.; *O.* (?) *Brongniarti*, Roualt; and *O.* (?) *Edwardsi*, Roualt—by the angular junction of the branches of its facial suture above the glabella.

(3.) From *O. radians*, McCoy—by the large number of the segment-markings on the axis of its pygidium, *O. radians* exhibiting only three. The head-shield of *O. radians* is unknown, but McCoy refers the species to Ogygia, on account of the short segmental furrows between the larger markings on the side lobes of the pygidium.

II. ON A SECOND NEW SPECIES OF ASAPHUS FROM CANADIAN ROCKS.

The accompanying figure represents a new species of Asaphus, from the Trenton limestone (Lower Silurian), of Peterborough, and other localities in Upper Canada. The same form is believed to occur also in the Utica Schist. General outline, a broad oval; length to breadth, as 3 to 2, or thereabouts; relative lengths of head-shield, thorax, and pygidium, as 1 : 0.87 : 0.87.

Head-shield obtusely pointed anteriorly, and much resembling that of *A. platycephalus* in its general outline. Limb striated with concentric lines; genal angles rounded; facial suture as shewn in the figure. The branches unite above the glabella in a well-defined angle, almost touching the extreme anterior margin of the head-shield, and they terminate at the lower margin, about midway between the glabella and the genal angles. Where they join this lower margin they make a short curve inwards (see the figure), somewhat as in *A. expansus*, a peculiarity not exhibited bv the facial sutures of *A. platycephalus* (?) or *A. Canadensis*. Glabella, feebly raised, and divided into two disinct portions; the lower portion of a semi-oval shape, is defined, as it were, by a prolongation of the body axis. Directly above this, an undulating furrow occurs (as shewn in the figure), strongly marked in



ASAPHUS HALLI.

(E. J. Chapman, sp. 1858)

the centre, but becoming fainter where it joins the facial suture, a little above the eyes. The anterior portion of the glabella is altogether undefined. The eyes appear to be of the usual Asaphus type; they are somewhat widely apart; the breadth between their central points, to the entire breadth of the head-shield across them, is as 5 to 9. Except at the striated limb, the whole surface of the head-shield is finely punctured.

Thorax with eight segments; division line between the axis of each segment and its pleuræ not very sharply defined. There are no intermediate V-shaped furrows, as in *A. Canadensis*. The pleuræ curve upwards at their slightly rounded extremities; they are furrowed to about half their length from the axis, and then crossed by a curvilinear ridge, beyond which the upper portions are delicately striated. The axis and the side lobes (in the transverse measurement of the trilobite) are of equal breadth. The middle segments of the axis are slightly broader than the upper and lower segments. The surface is very delicately punctured. The pygidium closely resembles that of *A. Canadensis*. In the axis there are from twelve to fourteen segment markings, with a similar number on each side lobe. There are no secondary furrows. The striæ on the limb are largely developed. *Hypostoma, &c.*, unknown. The two nearly perfect specimens and the various fragments of this species that I have examined, belong to individuals of comparatively large size. Of the perfect specimens, one is nearly five inches in length (= 127 millimetres), and the other exactly six inches (= 152.4 mill.)

Specific Differences. *Asaphus Halli*, on account of its rounded genal angles, need only be compared with the following species: *A. platycephalus*, Stokes (*Is. gigas*, Dekay, &c.); *A. expansus*, Linn.; *A. læviceps*, Dalman; *A. Barrandei*, de Verneuil; and *A.* (*Is.*) *affinis*, McCoy, the latter species being made to include Portlock's *Is. gigas*, *Is. planus*, and *Is. Powisii*. All the other well recognised species of Asaphus are horned forms.

The new species differs from *A. platycephalus*, more especially by its divided glabella, and by the presence of furrows on its pygidium.

It differs from *A. expansus* and *A. læviceps*, by the form of the glabella, the angular junction of the branches of the facial suture, and the segment-markings on the side lobes of the pygidium. The latter character distinguishes it also from *A. affinis*.

It differs from *A. laticostatus*, Green—of which species the genal

angles are unknown—by its thorax and pygidium being of equal or nearly equal length, and by its divided glabella.

M. de Verneuil's species, *A. Barrandei*, from the south of France, is only known to me by name. Reasoning from analogy, however, it may be fairly admitted that the two species are distinct.

Our new Canadian species somewhat approaches Barrande's *Asaphus nobilis*, by the curious transverse furrow on its glabella. In *A. nobilis*, however, the genal points of the head-shield terminate in horns, and the segments of the thoracic and caudal axis are marked by peculiar furrows, characters not exhibited by the present species. The transverse furrow on the head-shield probably corresponds more or less in outline with the underlying hypostoma, but no traces of the latter organ, as already remarked, have yet been found.

In the preceding article on *Asaphus Canadensis*, it was stated that Professor Hall had published, in the first volume of the "Palæontology of New York, two imperfect caudal shields, under the name of *Asaphus* (?) *Latimarginatus*. I would willingly adopt this specific name for our second Canadian form, because, so far as it is possible to determine, the two may prove eventually to be alike; but, on due consideration, I have thought it advisable to bestow upon the form in question a name altogether distinct. My object in this, is solely to avoid the chance of confusion, in case the thorax and head-shield of Professor Hall's form should hereafter be discovered, and be found on examination—as would very likely happen—to constitute a different species. I therefore claim the privilege of naming the trilobite described in this article, a privilege to which I am justly entitled by the really indefinite character of the figures referred to above. The name I adopt as the most appropriate, under the circumstances of the case, is that of *Asaphus Halli*. Palæontologists, I am sure, will receive it willingly.*

* The author's best thanks are due to his colleague the Rev. Professor Hincks, as well as to John Head, Esq., and J. F. Smith, Esq. of Toronto, for the loan of specimens of *Asaphus Canadensis*. He has also to express his obligations to the Rev. Vincent Clementi of Peterborough, Canada West, for a specimen of *Asaphus Halli*.

REVIEWS.

Report of the Commissioner of Patents for the year 1856.—*Agriculture.* Washington: 1857.

We have here a volume consisting of upwards of five hundred pages, well printed and profusely illustrated. It furnishes another of the many examples constantly presented to us, of the public-spirited liberality with which the funds of the United States are expended on objects of general interest and value; lying altogether beyond the range of political influence. Such reports frequently embody matter of great importance. We shall endeavor to indicate the nature of this very miscellaneous but highly useful volume. The subjects treated of are various, including several of general interest and of national importance; such as the origin, history and habits of the domesticated animals; birds injurious to agriculture; improvement of land; drainage, &c.; fertilisers; the culture of wheat, potatoes, Chinese yam, sugar, &c.; Textile and forage crops; hemp, cotton, &c.; grafting and budding; reports on fruit culture; wine making; meteorology, &c.

It appears that the Government of the United States appropriated in 1856 the munificent sum of seventy-five thousand dollars for agricultural purposes; upwards of twenty thousand of which were expended in the purchase and freight of foreign seeds for experimental purposes in various sections of the Union. Nearly eighteen thousand dollars were absorbed by salaries and expenses incurred in the preparation of the Report; two hundred and ten thousand copies of which were ordered to be printed at the expense of Congress. It was deemed expedient to afford to the planters of Louisiana and adjoining States, the means of replenishing the stock of cane from which sugar has been heretofore solely obtained. The sugar crop has for years been gradually diminishing in the southern States, in consequence, it is thought, of the cane being carried further north than its native and congenial climate. To remedy this evil ten thousand dollars were expended in procuring fresh plants from South America, in numbers sufficient to enable every sugar planter within a few years to introduce the new and vigorous plants, and so to displace entirely such as are old and deteriorated. Changes of this nature in the several departments of cultivation, when made with judgment, are usually attended with the happiest results.

The Report contains a long and very able article (one of a series) on Meteorology in its connection with Agriculture, by Professor Henry, Secretary of the Smithsonian Institution, illustrated by a chart of Isothermal lines in North America, as determined by the joint labors of many observers throughout the continent. The mode hitherto adopted of collecting Meteorological facts by a staff of experienced observers scattered through the country, and of making such deductions therefrom as pertain to agriculture, has been attended with increasing confidence in its eventual utility. Already these exertions have thrown much interesting light on the climatology of this continent, and enabled us to comprehend, in some degree, phenomena that were previously regarded as anomalous. By presenting some of the physical laws on which meteorology depends, the general principles at which it has arrived, and their application to the peculiarities of the climate of the United States, it is hoped to awaken a more lively and general interest in the subject. The system about being introduced in Upper Canada, of furnishing the principal grammar schools with correct instruments for ascertaining the more interesting and important meteorological phenomena, and carefully registering the same, will, no doubt, constitute a useful auxiliary to similar agencies in the neighbouring republic, and be productive of valuable results.

It appears that the chemical analysis of soils, products, manures, &c.; with entomological researches, and botanical investigations, recommended in the previous report of 1855, have not been carried into effect. These investigations, however, have not been wholly lost sight of. Individuals and scientific societies have to some extent commenced them, and in a few instances carried them to a successful issue. That chemistry is destined to achieve similar triumphs in the wide and interesting field of agricultural research, to those it has already won in physiology and the arts, few can reasonably doubt; and the future progress of this all important pnrsuit will in no small degree depend upon chemical discovery, with its varied applications. Hitherto there has been much both of dogged scepticism and unreasonable expectation in relation to these matters; some obstinately affirming that science is incapable of affording any aid to the practical farmer, while others as vehemently maintain that chemistry alone is already capable of pouring a flood of light on the most hidden processes of his art. Chemical analysis, as commonly conducted, has certainly not realised the sanguine expectations expressed not many years since, when Baron Liebig presented his celebrated report to the British Association for the Advancement of Science. It should be borne in mind, however, that

all healthy progress, whether social or scientific, is usually of slow growth. Let the agriculturist and chemist earnestly and repeatedly interrogate nature, and await her reply in the true spirit of faith and patience, and the way of progress will appear clear and certain.

The services of a botanist engaged by the State, as proposed in a former Patent Offie Report, might no doubt be made of great economic value, as for instance in the department of agricultural grasses. Still when the British Islands are regarded as a sort of standard in reference to pasturage and grazing, we on this continent must make the necessary allowance in our estimates, arising from diversities of climate, or we shall certainly be deceived when we come to practical results. The extremes of heat and cold, with the frequent sudden changes of temperature, so generally characteristic of the climate of this continent, will not allow either of the number or kinds of grasses that are indigenous to the soil, and constitute the permanent pastures of the old country. That the pastures of North America are susceptible of immense improvement no one can doubt; and in the following observations of the report we entirely concur:—

"There is no subject of more importance to the American farmer than the knowledge of the means which shall best enable him to increase the number and value of his live stock, of which grass furnishes the principal sustenance. It may safely be said that the great defect in our agriculture is the failure to rear the proper number and quality of animals. The experience of England and France sufficiently demonstrates the important truth, that on the same number of acres which are now cultivated in the United States, if the quantity of live stock were doubled, the aggregate quantity of grain produced might also be greatly increased, and without any corresponding increase of expense. The explanation of what seems at first so paradoxical is found in the fact that, in this manner, the land would be kept constantly in better heart. Instead of deteriorating from year to year, as is the case when grain alone is the principal product, if a proper proportion of live stock were reared, the land would retain its fertility for centuries, and might, perhaps, be constantly improving. The effort to keep up the productiveness of land, which is solely used for the cultivation of grain, by means of guano or artificial manures, is believed to be a vicious system of husbandry. That such manures are highly valuable in their way, and, in the hands of the judicious cultivator, will produce advantages which can hardly be over-estimated, is undoubtedly true; but, after all, with the exception of the alkalies and phosphates they contain, they do not possess the elements of permanent benefit. They should be regarded as in the nature of medicines, or like artificial stimulants on the human system. The true pabulum of the soil, provided and arranged by nature for this very purpose, is obtained by the rearing of live stock, and in no other manner. Indeed, it is probably true that the use of other manures, followed by the continual cropping of the grain for market, will be found in the end only to render the soil more hopelessly bankrupt. It will galvanize it into spasmodic action for the

occasion, but leave it afterwards more prostrate than before. . . . . . The skilful and wise cultivator so graduates the growth and disposition of his products as not to draw from the soil what is not in some manner fully restored to it. No system of agriculture has been discovered for accomplishing this purpose effectually, but the simple and natural one of rearing a large proportion of domestic animals, sufficient to consume most of the products of the farm upon its surface."

The principle above enunciated, viz., the making farms self-sustaining as regards manures, is doubtless a sound one, but it should admit of modifications to meet the wants of varying conditions and circumstances. In the neighborhood of large populations, the farmer often finds it to his advantage to dispose of his hay, straw, &c., and purchase manure in their stead. Barnyard manure containing all the ingredients necessary to the growth and maturity of plants is always more or less certain in its action; the only objection of a practical nature is that it is too bulky to transport to long distances, whereas artificial manures are more concentrated, and can be widely and cheaply applied, so far as the expense of transport is concerned, to the more remote parts of the country. As a general rule, in a country like this, those manures, which usually contain only a portion of the constituents of plants, should be principally employed on defective or worn-out soils, with a view not only to the increase of grain, but more especially to that of the grasses, the chief source from which domestic animals derive their sustenance, and the sure way of promoting permanent fertility.

It would appear from a number of facts embodied in the Report, that the recent introduction of the Chinese yam into the United States has not been attended by any very encouraging degree of success, and that its economic value is still debateable. And with regard to the Chinese sugar-cane, although the results of experimentalists are by no means uniform, varying of course according to differences of soil, climate, culture, &c., yet upon the whole there is sufficient evidence to conclude that its utility is hardly doubtful. If in the northern portion of the States it should ultimately be found not adapted to the production of sugar, as would seem to be the case from the little experience we have of it in Canada, there appears no reason to doubt but that it will, at least, prove a valuable forage crop. We find from experiment that it can be cut for such purpose twice during the season, and that it is relished by horses, cattle, and pigs. We are also inclined to think that it may prove an accession to our cultivated crops, from the amount of syrup which it yields, and the Report contains several facts in confirmation of this view.

The articles on the domesticated animals, drainage of land, and Fertilizers, will all repay a careful perusal, although they contain little or nothing of novelty, either as to facts or illustrations: most of the matter may be found in the usual standard publications that treat of such subjects. "The English and Scotch systems of dairy management" is a carefully compiled paper from authentic sources, and cannot fail to improve that important department of American husbandry.

The birds injurious to agriculture, and the quadrupeds of Illinois injurious and beneficial to the farmer, are the only papers that can claim much originality, either in execution or mode of application. The accompanying illustrative engravings are numerous, and, for such a work, pretty well executed. The cuts will throw much interesting light on the text; and we have no doubt but these articles will be perused with interest and profit, not only by farmers, but by a large circle of general readers.

Upon the whole, the annual volumes issued by the Patent Office, strongly indicate a progressive improvement, and the zeal and activity of the Department. And when it is considered that the mechanical and manufacturing arts receive at its hands at least an equal share of attention and patronage with agriculture, there is sufficient ground for concluding, that such an organization so liberally sustained by the State, must be productive of the most valuable and wide-spread benefits to the country at large.

Contributions to the Natural History of the United States of America. By Louis Agassiz. First Monograph. Vols. I. and II. Boston: Little, Brown & Co. London: Trübner & Co., 1857.

At length we have received two volumes of this fine work. Of delay previous to publication we make no complaint, as it was obviously occasioned by a desire to improve the valuable materials collected; but we confess we felt some dissatisfaction, when week after week passed away, after we knew the volumes to be in the hands of others, without a copy reaching Canadian subscribers. The publishers, we trust, will see the propriety of treating all subscribers alike in this respect, and we venture at the same time to observe that, if there is sufficient reason for publishing two volumes together now, it is a departure from the proposed plan, likely to be inconvenient to many subscribers, and therefore to be avoided in future. The book is got up in a very handsome

style. The accompanying plates are beautifully executed and very valuable, doing the highest credit to all engaged upon them, and the contents of the volumes, consisting of a general introduction and exposition of the author's views on classification, with an admirable monograph on the North American Testudinata, cannot fail to be accounted an important contribution to science. There are occasionally points on which we cannot agree with the learned professor, but we fully feel the importance of his labours, and cordially thank him for the additions he has made to our knowledge in a highly interesting department, as well as for a clear and elegant exposition of his views respecting the principles of classification, and their practical application. We quote the following passage from Section VII. of the Essay on Classification, as a concise statement of the principles maintained:

"Thus far I have considered only those kinds of divisions which are introduced in almost all our modern classifications, and attempted to show that these groups are founded in nature, and ought not to be considered as artificial devices invented by man to facilitate his studies. Upon the closest scrutiny of the subject, I find that these divisions cover all the categories of relationship which exist among animals, as far as their structure is concerned.

"*Branches* or *types* are characterised by the plan of their structure:

"*Classes*, by the manner in which that plan is executed, as far as ways and means are concerned:

"*Orders*, by the degrees of complication of that structure:

"*Families*, by their form, as far as determined by structure:

"*Genera*, by the details of the execution in special parts, and

"*Species*, by the relations of individuals to one another, and to the world in which they live, as well as by the proportions of their parts, their ornamentation, &c."

The author goes on to speak of such divisions as *sub-classes*, *sub-orders*, *sub-families*, *sub-genera*, *varieties*, respecting which he thus expresses himself:

"These distinctions have long ago been introduced into our systems, and every practical naturalist who has made a special study of any class of the animal kingdom must have been impressed with the propriety of acknowledging a large number of sub-divisions, to express all the various degrees of affinity of the different members of any higher natural group. Now, while I maintain that the branches, the classes, the orders, the families, the genera, and the species are groups established in nature respectively upon different categories, and while I feel prepared to trace the natural limits of these groups, by the characteristic features upon which they are founded, I must confess at the same time that I have not yet been able to discover the principle which obtains in the limitation of their respective subdivisions. All I can say is, that all the different categories considered above, upon which branches, classes, orders, families, genera and species are founded, have their degrees, and upon these degrees, sub-classes, sub-orders, sub-families,

and sub-genera have been established. For the present their sub-division must be left to arbitrary estimations, and we shall have to deal with them as well as we can, as long as the principles which regulate these degrees in the different kinds of groups are not ascertained. I hope, nevertheless, that such arbitrary estimations are for ever removed from our science, as far as the categories themselves are concerned."

We are quite prepared to go with our author to the extent that, in every really good classification, man is only the interpreter of nature, and that every division rests upon really natural characters; but we must confess to some doubt as to the possibility of laying down precise laws as to the kind of characters upon which each degree in classification must be founded, and we must add that when we test the accuracy of the learned author's views, by the consideration of his own system, we cannot resist the conclusion that there is still something wrong, either in his principles or in their application. We are not easily convinced, for example, that fishes demand four *classes* in order properly to express their relations. Embryology is destined to afford the most important assistance to the naturalist, but the real value of its revelations must be judged of by comparison with other well established principles, and we must not be hastily led by it to multiply leading divisions. We are bound to acknowledge that our author proposes these classes with great modesty, and with some hesitation; and whilst expressing a present strong feeling against them, we would be prepared candidly to consider any evidence that may be produced.

The account given of various systems of classification is very valuable, and shows the author's power of doing justice to those whose views differ widely from his own, and appreciating what is good whilst offering candid criticism. Possibly Macleay and his followers have found in him the least appreciation of the kind of merit they possess, and may justly seem to be undervalued; but this part of the work will be found useful by many, and its execution cannot but be admired for extent of information, clearness and conciseness of statement, and liberal though profound criticism.

It is time now that we invite the reader's attention to the first monograph, a treatise on North American Testudinata. Any attempt, within the space we can command, to give an abstract of the contents would be useless, and still less can we give expression to the doubts or difficulties which occur to us. The author makes Testudinata (a name which has precedence of Chelonians) the highest order of the class Reptilia, and considers it as containing the two sub-orders Chelonii and Amydae, the former of which he makes to consist of two families,

Chelonioidæ and Sphargididæ, whilst the latter is regarded by him as including seven families. We have then an examination of all the particulars in the organization of the family. Sections follow on their growth, Psychological developement, geographical distribution, and fossil history. The characters of the sub-orders are then more particularly considered, which leads us to the conclusion of the first chapter. Desiring to bring under the notice of our readers any peculiar and striking opinions of our author, whether or not we are able at once to receive them in their whole extent, we quote the following passage from the concluding section:

"Such a method" [full anatomical illustrations of structure in Zoological works] "will, in due time, relieve our science of all the exaggerations respecting homologies, with which it has of late been incumbered. As soon as it is understood that the great branches of the animal kingdom are characterised by different plans of structure, and not by peculiar structures, we shall have fewer of those unsuccessful attempts to force every peculiarity of every type into a diagram, by which, renouncing almost entirely the study of the wonderful combinations of thought which are manifested in the endless diversity of living beings, authors substitute for them a dead formula of their own making. Having once understood, for instance, what constitutes the plan of Vertebrates, we shall be prepared to find it executed in a variety of ways, and with innumerable complications; and we shall no longer try to force the framework of a fish into a Procrustean bed, to which we may reduce at the same time all other Vertebrates, with man. When the axis of the body consists of a simple dorsal cord, we shall be willing to acknowledge that it is not to be considered as an articulated back-bone; when the skull–box consists of a continuous cartilage, that it is not to be artificially divided into isolated parts; and, where there are no limbs at all, we shall not assume that they exist potentially in the same degree of complication as in animals more favourably endowed. And let it not be supposed that such sobriety of views excludes general comparisons; it only withdraws them from the field of fancy to the rich field of life."

We must not stop now to suggest the explanation and defence with which a disciple of RICHARD OWEN might reply to this passage, but the subject is certainly open to further discussion. The second chapter is devoted to the families of Testudinata; the third to the genera and species, concluding with a view of the Chelonian faunæ of North America. The second volume is entirely devoted to the Embryology of the order. We can hardly express too highly our estimate of the value of this portion, which deserves the careful study of those who desire really to understand this division of the animal kingdom, and which displays an amount of exact knowledge, patient industry, and minute research worthy of all praise. If these volumes, by the extraordinary success of the subscription list, commemorate the great

popularity of their author, and his pre-eminent power of awakening interest in the subjects to which he is devoted; they also form a noble and durable monument of his genius and learning, which his friends and his adopted country will contemplate with proud gratification.

W. H.

Human Physiology, Statical and Dynamical: or, the conditions and course of the life of man. By John William Draper, M. D., LL.D., Professor of Chemistry and Physiology in the University of New York. Harper & Brothers, New York. 1856.

Well may a retrospect of the last thirty years bring to the chemist cause for congratulation and quiet triumph; for during that period the march of chemistry has been an ever-accelerating, almost culminating power, and ever more comprehensive in its application to the laws of physiology: indeed far beyond that period its influence and history may be traced even to the Iatro-chemical schools of the middle of the 17th century. But we have no wish to recall that time, not from shame, however; and we prefer leaving the statement as it is, inasmuch as exact chemistry may justly be said to date from the discovery of oxygen in 1772, and its association with the phenomena of life in rational connection cannot strictly be placed at a period earlier than that given, viz., at thirty or forty years past.

At this day more than at any other, without figure, the chemist perceives that the cosmos—universal nature—is an illimitable laboratory:—that in the abyss where sparkle distant worlds, and in the microscopic cell, its laws are unremittingly at work producing those cosmic mutations and transformations by which planets are built up, and, as in ours, are probably stratified and geologically arranged; and that in cell evolution its affinities are unweariedly developing those complex relations which end in the expanded membrane—the deployed tissue—the rolled canal—the elongated fibre—the rigid bone—the perfected animal:—whole—complete—self-contained—independent.

If we trace the influence of chemistry in explaining the functions of organisms—which is nothing other than an assemblage or system of organs—beyond the last forty years, we shall find that from the time of Scheele, Priestley, and Lavoisier, almost up to that of Liebig, little disposition was shown to give it the prominence which in later years, at first sparingly and with reluctance, and more recently without stint, has been, conceded. Look at the history of oxygen which

recognized as vital, and even styled empyreal air, was of course known to be necessary to breathing animals, but whose action within and without the system was not admitted to be the same in kind and degree; it is true that tardily and almost by compulsion the true relation of this gas to respiration in its full meaning was perceived, but whether its effects were confined to the lungs or extended to the system at large, remained for at least forty years a mooted question even up to the time of Edwards: to what was colorification attributed? certainly to the action of oxygen, but not directly; for, while arterialization was the result of its absorption into the blood, and carbonic acid was exhaled from the lungs, being formed therein, animal heat was caused by the difference of capacity for caloric of arterial and venous blood—an application of Black's theory of latent heat. Lavoisier had clear conceptions on the matter, which there is reason to believe would, had he been permitted to give them, have anticipated the exact views of the moderns; yet with this exception and meagre, timid and hesitating admissions of the possibility of such an action, oxygen was held to oxygenate the blood and nothing more. Chemistry was deemed too common and consequently too mean a science to hold intercourse with life. For thus overlooking and depreciating the agency of chemistry there is excuse; it had hitherto done little for physiology, and the latter rested but little and depended less on the laws of the former for the elucidation of any of its functions: accurate anatomists—pure solidists—the physiologists of that day, accounted for the vital functions on mechanical principles. When, however, the relation was perceived, it rapidly increased to closer connections and inseparable alliance, so that in the cycle of the actual state of chemistry we may limit our research to the air—to the soil—to the food derived from both, and to the animal the aggregate microcosm of the three: so may we trace down our biography and measure its intrinsic value.

The work which heads this article is written by a professor of chemistry, and is another proof of the advance in the manner already pointed out. For several years we find that physiologists have more and more trusted to chemistry for the explanation of many of the obscure portions of their subject, and more and more have been multiplied works of physiological chemistry. Simon, and Lehmann, and Robim and Verdeil, all attest this—and now reciprocally we see a chemist become physiologist, which in truth every chemist virtually must be. If man ever can attain to an absolute knowledge of his functions, chemistry must undoubtedly be the light to guide him in his path; nor is this an unwarrantable assertion: at the enthusiasm

of the chemists a smile may be excited—some fears may be entertained that they shall be carried clear off their feet in their rapid progress—but we care little for the first and have no apprehension of the last gentle suggestion. They are not yet beyond their depth, and the rather that they are borne on the full stream—they have no idea of possessing, as their progenitors the alchemists had, "the art of perfection;" alas, they know too well in this meaning, and pathologically, that theirs is but the art of imperfection; for, knowing the normal and abnormal states, they may explain but not imitate the former, nor always cure the latter;—to what branch or department of the whole circle of the sciences can we turn to obtain even an insight into the mechanisms of organization—what positive science can avail us in our search? None—not one—other than this which lays bare the pregnant and instinct affinities of its forces in the simplest products of its action from the formation of water and carbonic acid gas to the elaboration of tissue—of secretion and excretion.

At the present day these subjects (chemistry and physiology) are not only closely allied, but almost identified, and the publication by Professor Draper is but evidence of the fact now pointed out; a publication opportune, graceful, and, as far as the work goes, meriting commendation. In a spirit then not only of social consideration, but of professional respect, we have perused this book, and select such portions as our time and the interest of the subjects permit and urge us to do—premising that as an original work it cannot, of course, be considered—being nothing more in reality than a compilation, and that a rather curt one, of what is known on the subject of which it treats.

His arrangement is peculiar, and, unlike recent writers either on physiology or physiological chemistry, he does not open the subject by a history and description of the elements which enter into the composition of the organism—he scarcely indeed alludes to what Robin we believe calls stoichiology—himself a chemist and familiar with that which he daily teaches, he seems to forget that others may not be in the same happy state, and, curiously enough, does not dwell on its influence so prominently as the pure physiologists constantly do. While then these last introduce many pages of the chemistry of the stoicheia—for so the elements or principles were called by the Greeks—originally meaning a letter, by easy transition, from being an element in the name, it became an element in the thing named. Dr. Draper at once, *per saltum*, begins with nutrition. So, too, his division into statical and dynamic is singular—perhaps original—very

mathematical, but certainly not biological; where all are dynamic, the result at least of some principle or agency (the vital principle he almost condemns, and yet offers no other "final cause" in its stead) —no function, *per se*, can be regarded as statical when every thing is marked by perpetual change, where in nutrition we have the task of the Danaides in evidence—a perpetual filling and a perpetual emptying —where the parts come and go—are elaborated and destroyed, there cannot be said to exist the state of equilibrium. Taken as a whole, doubtless, the sum of the functions leads to what is justly considered static or normal condition, but individually not so: the whole is made up of its parts, but here the parts (organs) maintain the whole. The division, were the desire of peculiarity the object, might have been into hematogenic or histogenic, within which category all could justly be classed, and neurasthetics, into the functions of nutrition and those of the nerves cranial, spinal, and sympathetic; but the division of Bichat is really in our idea the least objectionable. The book will answer well for the educated man or the practitioner, for whom this survey, at once condensed, accurate and excellent, will be an epitome of biology; but to the student of medicine, we much fear that it can scarcely, to the exclusion of others more elementary though more diffuse, be recommended as a text-book, so that a large portion of its popularity may thus not be attained. Of the wood-cuts we can speak in unqualified terms—many of them are from other authors—some of them original and obtained by the aid of the microscope applied to photography, "the process having been so far improved by the author as to be rendered very available for these uses."

Selecting one of the many chapters which merit notice, that on respiration, and that portion of it especially which describes the entrance of the air into the lungs, three stages are given: 1st, the filling of the trachea and larger ramifications of the bronchial tubes; 2nd. The translation of the fresh air from the bronchial tubes to the ultimate air cells (vesicles), accomplished by gaseous diffusion; the 3rd stage is the passage from the vesicles to the blood, through the wall of the air cell (epithelium and mucous membrane)—the wall of the blood vessel and the sac of the blood disc; this involves movement through membranes and implies condensing action. The first of these is well understood, was surmised even by Empedocles, and has never been misinterpreted; the second is not so simple, is consecutive and gradual, and, in his own words, is thus performed: "The carbonic acid, vapor of water and excess of nitrogen, if any, that have accumulated in the cells belonging to any given bronchial tree, are expelled therefrom by

the muscular contraction of the circular organic fibres, and are delivered into the larger bronchial tubes, in which diffusion at once takes place with the air just introduced; as soon as the expiration is completed, relaxation of the muscular fibres occurs, and the passages and air cells dilating both through their own elasticity and the exhaustive effect arising from the simultaneous contraction of other bronchial trees, fresh air is drawn into them: the alternate expulsion and introduction being accomplished by muscular contraction and elasticity; *the different bronchial trees coming into action at different periods of time, some being contracting while others are dilating.*" With the first portions of this extract we have no fault to find; besides the information given, the impression is that the vesicles contain a larger percentage of carbonic acid than the tubes, and these than the trachea—just as the trachea has more than the atmosphere without; it gives the distinct information that the act of inspiration is not instant but consecutive—that the pure air does not at once reach the periphery of the air cells, but is diffused into, intermingled with that left after the preceding expiration; but that with each flow and ebb of this tidal current, less charged air penetrates to the utmost bounds of its excursion, while a relatively noxious mixture is in turn expelled into the ethereal reservoir without, in each act of inspiration and expiration, the whole volume of the air in the lungs is in movement, and hence the vesicular murmur heard by the ear. But the whole of the deteriorated air is not expelled, nor is the whole of the oxygen of the inspired air absorbed; portions of each are being commingled, the one losing carbonic and acquiring oxygen, while the reverse occurs with the other; and hence the comprehension of the value of a sigh-deep inspiration, in languid or depressed condition, and so, too, the positive luxury of a sneeze, in which a larger volume than ordinary of vitiated air is expelled and a proportionately large inspiration follows. So, too, we think may be explained the effect of blowing steadily for a short time—a fire, for instance—by which act many persons are made to feel giddy—a cerebral effect, doubtless; during the act of blowing in this manner, it is not air from the lungs that is expelled, but air drawn in through the nostrils; thus then expiration, properly speaking, is not efficiently carried on, accumulation of carbonic acid *pro tanto* occurs, begins to influence the system, the first manifestation of which is that of giddiness. A part of this effect may be and is, we believe, usually wholly attributed to the pressure on the jugular veins, retarding during the act the return of the blood from the brain; but that this cannot be the sole cause is shown by the fact that exertion,

as in lifting for instance, does not produce the same effect even though the vessels swell and be visibly prominent.

To the portion of the extract which we have sketched and amplified we said that we offered no objection, but to that portion which we have italicised we do make exception. We cannot perceive why and how different bronchial trees (an expression equivalent to ramification we suppose) come into action at different periods of time, some contracting (we omit the word being as redundant and in reality ungrammatical), while others are dilating. Most assuredly nothing proves this; in the normal state the air penetrates to the utmost bounds of the ramifications, but with unequal velocity, yet, in equivalent regional zones, if we may so geographically designate them, in equal quantity, in a proportion best perhaps expressed by the inverse ratio of the distance from the glottis, every vesicle dilating and contracting synchronously, all receive the purified air simultaneously, all partially expelling the vitiated air coincidently; the first portions of this air, when tested, giving a notably smaller percentage of carbonic acid than the last portions. We cannot conceive that some air cells are patent to receive, while others in their vicinity are contracted to expel air; were this so, what oscillation, so to speak, would ensue? Just such as we have revealed in some forms of asthma and emphysema, and even occasionally in bronchitis, and the first period of tuberculosis: certainly not the soft, breezily audible whisper or murmur which the ear detects and experience regards as the manifestation of the normal of healthy breathing; and so too is audible the same sound, but shorter in duration, during expiration, and this, without disease, as Cammann's stethoscope proves. The third stage or the passage of the oxygen from the air cells to the blood is carefully explained, and the volume of the oxygen absorbed being greater than that of the carbonic acid evolved is shown not to depend on the diffusion law of volumes of these gases as originally given by Professor Graham, and adopted by Valentin and Brunner, but on the conjoint condensing action of moist membranes, as of the cell wall, of the pulmonary capillary vessel and of the blood disc, which action disturbs the condition of ordinary diffusion. For these views, partly the result of his own experiments and of those of Professor Mitchell of Philadelphia, we refer the reader to the work itself.

This, by the way, would seem to indicate that the author regards the blood disc as an oxygen carrier, so indeed he says, p. 128: "They (the discs or cells) receive that vivifying principle as they move over the respiratory cells, and freighted with it, pass to all parts of the body, not united with it, nor disorganized, nor burnt up by it, but

holding it loosely and ready to give it up, and go back again for a fresh supply." Now, herein lies a grave question; is the oxygen merely mechanically absorbed by the blood, for it is admitted that other constituents than the corpuscles absorb oxygen, or does it enter into combination, unstable, yet chemical? Many lean to the former view, we to the latter, and we confess that with the apodictic reasons of Liebig we very nearly coincide. But we cannot give to these their proper consideration; in truth much beyond our wish have these remarks been carried in extent, and hence anxious, not to weary the reader, we hurry to a conclusion.

To an amusing paragraph on saliva we would in sad earnest draw the attention of those who are given to the solace of tobacco, that best and worst of sedatives: "Though so large a quantity of saliva as twenty ounces may be secreted in a day, this being about one half of the urinary discharge, it is to be remembered that the water is not lost to the system, as in the latter case. If here the impure habit of profuse spitting is indulged in, it is interesting to remark (*more physiologico*), the reflected effect which takes place in the reduced quantity of urine and an instinctive desire for water, a kind of perpetual thirst. It is probable that under these disgusting circumstances, the percentage amount of saline substances in the saliva is increased, and that, so far as that class of bodies is concerned, the salivary glands act vicariously for the kidneys, and the mouth is thus converted into a urinary aqueduct."

Of the brevity of some of the descriptions we have already spoken, this is a fault almost everywhere to be perceived, thus in that most obscure portion of the economy, the region and functions of the liver, the author dismisses the composition of the bile in this summary way: "Bile, from whatever animal it may have been derived, contains a resinous soda salt, a coloring material, cholesterin and mucus, the acid of the soda salt is the taurocholic or glycocholic." Taurine is a few lines below mentioned; this verges on the incomplete, almost on the inaccurate; if there be hope of finally comprehending the functions of this or any other organ, a knowledge of the composition of its peculiar secretion ought surely to be an element in the sequence of reasoning thereon. To speak of the glycocholate or taurocholate of soda, as if one or the other of these solely, and not both, existed in bile is to give a wrong impression to those who have not the means of ascertaining the facts. It seems as if the fullness of his vision had condensed, but yet contracted his intellect as light contracts the pupil, so that he compels his readers to see through the same medium.

Hence on the "book and volume of the brain" there are produced sparse and detached bright spots instead of a broad sheet of diffused light illustrating in clear display the wide expanse, teeming with richness, gravid with genetic force. W. S.

History of Ancient Pottery. By Samuel Birch, F. S. A. 2 vols. 8vo. London: John Murray. 1858.

The value of fictile remains of ancient art, as instructive memorials of the past, grows more and more in general appreciation; and now, through the labors of Mr. Samuel Birch, of the British Museum, we are in possession of a highly condensed and portable book of reference on nearly all that relates to the history and classification of ancient pottery. The subject is no insignificant one in the hands of an archæologist so accomplished and laborious. The potter's art has, in all lands, long preceded the labors of the chronicler of history, and has thereby preserved to us many a lively record of ages whose heroes are all unsung. The primeval civilization of Egypt and Assyria is thus exhibited, and the oldest definite chronicles of the East come down to us in like manner,—not on papyrus or parchment, but on the potter's clay. From the bricks of Egypt have been recovered names of her ancient dynasties, and the cartouches of Pharaohs, whose architectural memorials Time slowly erases from the half-deciphered history of the Nile-valley. The Assyrian and Babylonian bricks have become inseparably associated, in the popular mind, with the mysteries of Cuneatic inscriptions; while in later and more familiar eras of ancient history, the impressed brick gives us the names of Roman Consuls, and appropriates the works of Roman cohorts. Thus we find the tiles of Chester, the Roman *Deva*, bearing the name and title of the Twentieth Legion, LEG. XX. V.V. Again, at York, we learn from like fictile chronicles, that the military architecture of the Roman *Eburacum*, was executed by the Second, and by the Ninth Spanish Legion, LEG. VI. VICT. and LEG. IX. HISP.; while of greater interest is the accepted interpretation of the CL. BR. generally found on the Roman bricks and tiles discovered along the Kentish coast, the *classiarii Britannici*—the marines of the British fleet; or the more conjectural rendering of the P. P. BR. LON. of the London tiles—*proprætor Britanniæ Londinii*, which, if accepted, establishes the metropoli-

tan character of Roman London as the seat of government of the propraetor of Britain. We presume it is due to a typographical slip that we receive from Mr. Birch a novel reading whereby the Roman propraetor becomes the *proprietor* of London, in the following paragraph:

"Some fragments of tiles or bricks, evidently the *semilateres*, or half-bricks of Vitruvius, dug up on the site of the Post Office in London, were impressed with the letters P. P. BR. LON., denoting the residence of the Roman proprietor in Britain. (!) Still more interesting are the inscriptions stamped on the tiles relating to the legions and other military divisions stationed throughout the provinces of the vast empire. They contain the number and titles of the legions, and mark the limits of the Roman conquests. The route of the XXII. Legion has been traced through Germany; and in our own country, an examination and comparison of these tiles, shows the distribution of the military force, and the change of the quarters of the different legions which held Britain in subjection."

From the simple brick we pass, by natural gradation, to the more elaborate clay cylinders of Mesopotamia and Assyria,—not stamped like the tile, with mere epithets or titles, but executed on purpose to preserve the national chronicles entrusted to their durable custody; and thus we find ourselves transferred at once from the mere consideration of the potter's ingenious and tasteful art, to the investigation of some of the most ancient of human records, coeval with portions of the Old Testament scriptures, and furnishing the materials wherewith a Rawlinson and a Wilkinson now seek to illustrate and supplement the narrative of "the Father of History."

It might scarcely be anticipated that volumes devoted exclusively to the elucidation of the *History of Pottery*, would be found to bear any relation to the *History of Herodotus*—yet so it is; nor is it by any far-fetched process that the connexion is established.

"The materials used for writing on," says Mr. Birch, "have varied in different ages and nations. Among the Egyptians, slices of limestone, leather, linen, and papyrus, especially the last, were universally employed. The Greeks used bronze and stone for public monuments, wax for memorandums, and papyrus for the ordinary transactions of life. The kings of Pergamus adopted parchment; and the other nations of the ancient world chiefly depended on a supply of the paper of Egypt. But the Assyrians and Babylonians employed for their public archives, their astronomical computations, their religious dedications, their historical annals, and even for title-deeds and bills of exchange, tablets, cylinders, and hexagonal prisms of terra-cotta. Two of these cylinders, still extant, contain the history of the campaign of Sennacherib against the kingdom of Judah; and two others, exhumed from the Birs Nimrud, give a detailed account of the dedication of the great temple by Nebuchadnezzar to the seven planets. To this indestructible material, and to the happy idea of employing it in this manner, the present

age is indebted for a detailed history of the Assyrian monarchy; whilst the decades of Livy, the plays of Menander, and the lays of Anacreon, confided to a more perishable material, have either wholly or partly disappeared amidst the wreck of empires."

The certainty which attaches to every recorded name or word, apart from all reasoning or induction, gives a peculiar importance to such records; and hence even the potters' stamps on the fine red Samian ware, or the ruder initials on the handle of the old Roman amphora, have a significance and a value; while the stamp of the broken tile or brick supplies a fragment of history, more unquestionable than Herodotus, and far more trust-worthy than Livy. And yet these are, for the most part, the rudest and least studied works of the old fictile artificer.

It thus becomes a subject of unwonted interest to follow down—not in mere imagination, but by investigation and inductive reasoning,—the successive stages of the first workers in clay; the making of the rude sun-dried bricks by the presumptuous builders on the plain of Shinar, or by the oppressed Israelites in their Egyptian Goshen; the invention of the brick-kiln, and the grand conversion of the destructive element of fire into the most conservative of powers. Next comes the construction of the rude domestic, or sepulchral urn; the introduction of decorative arts in varying form; the application of indented patterns on the plastic clay; or, finally, the discovery of pigments, from the fictile employment of which grew at length the art of an Apelles, as in the higher skill of the plastic modeller we may trace the germ of Phidian art, and all the beauty which genius has perpetuated in marble and enduring brass.

The use of clay as the first plastic vehicle of the modeller's thoughts, from which, by means of moulds, his art could be multiplied and modified by numerous combinations of parts; and, again, the invention of the potter's wheel: each mark progressive stages in the development of human intellect; though doubtless such inventions were independently made in many separate centres of isolated and immature civilization.

A well-known Egyptian sculpture, on the walls of the Temple of Philæ, represents the ram-headed Phtah holding a rounded object on a potter's wheel, which he turns with his foot, and, as the inscription implies, as "the Father of Creation, sets in motion the egg of the sun and moon." The same inscription is differently rendered by Gliddon, in his "Ancient Egypt;" but there is little room for questioning the interpretation of the sculpture, in so far as

it illustrates the ancient Egyptian mode of using the potter's wheel. It may also not unfitly serve to illustrate the beautiful metaphor of Isaiah: "But now, O Lord, thou art our Father; we are the clay, and thou our Potter; and we are all the work of thy hand." On the subject of the potter's wheel, so important in relation to the development of fictile art, Mr. Birch remarks:

"The application of clay to the making of vases, probably soon caused the invention of the potter's wheel, before which period only vessels fashioned by the hand, and of rude unsymmetrical shape, could have been made. But the application of a circular lathe, laid horizontally, and revolving on a certain pivot, on which the clay was placed, and to which it adhered, was in its day a truly wonderful advance in the art. As the wheel spun round, all combinations of oval, spherical, and cylindrical forms could be produced, and the vases became not only symmetrical in their proportions, but true in their capacity. The invention of the wheel has been ascribed to all the great nations of antiquity. It is represented in full activity in the Egyptian sculptures. It is mentioned in the Scriptures; and was certainly in use at an early period in Assyria. The Greeks and Romans have attributed it to a Scythian philosopher, and to the States of Athens, Corinth, and Sicyon, the three great rivals in the ceramic art. The very oldest vases of Greece, some of which are supposed to have been made in the heroic ages, bear marks of having been turned upon the wheel. Indeed, it is not possible to find any Greek vases except those made by the wheel or by moulds; which latter process was applied only at a late period to their production."

On the subject of the Greek vases here referred to, Mr. Birch enlarges in terms that would seem extravagant to any one unfamiliar with the grace and beauty of Hellenic fictile art, of which so many exquisite specimens are accumulated in the Museum of which he is so distinguished an officer. In form, they are worthy to stand alongside of the works of the Parthenon; while in their decorations we have preserved to us the sole evidence of what Greek pictorial art actually was in the age of Pericles. The marbles of that grand era of art survive, mutilated, yet wonderful in the genius which their fragments reveal; but the painters of the same era are to us but names, and the very stories preserved in evidence of their perfection,—as the competitive pictures of the curtain and the grapes,—suggest to the modern critic a mere mimetic art, like that of our Van Huysums of the modern Dutch School, rather than of the Da Vinci and Raphael, who maintained the rank of their pictorial creations alongside of that which the chisel of Michael Angelo restored to the work of the sculptor. On these grounds, the painted vases of ancient Greek, Etruscan, and Italian art have a peculiar importance, which attaches in an especial manner to those of Hellenic origin, alike from their intrinsic value and from the fact that they

are actual pictorial works contemporaneous with the rise and full development of the Attic Drama, or produced under the later fostering largess of the Macedonian Conqueror. They occasionally depict scenes from Æschylus or Euripides, drawn by contemporary pencils; or exhibit the actual products of art of those who have listened to the Philippics of Demosthenes, or wrought for the gold of Alexander. Mr. Birch accordingly remarks:

"By the application of painting to vases, the Greeks made them something more than mere articles of commercial value or daily use. They have become a reflection of the paintings of the Greek schools, and an inexhaustible source for illustrating the mythology, manners, customs, and literature of Greece. Unfortunately, very few are ornamented with historical subjects; yet history receives occasional illustration from them; and the representations of the burning of Crœsus, the orgies of Anacreon, the wealth of Arcesilaus, and the meeting of Alcæus and Sappho, lead us to hope that future discoveries may offer additional examples. The Rhapsodists, the Cyclic poets, the great Tragedians, and the writers of Comedy, can be amply illustrated from these remains, which represent many scenes derived from their immortal productions; and the obscurer traditions, preserved by the scholiasts and other compilers, receive unexpected elucidations from them. Even the Roman lamps and red ware, stamped with subjects in relief, present many remarkable representations of works of art, and many illustrations of customs and manners, and historical events; such as the golden candlestick of the Jews borne in the triumph of Titus, the celebration of the secular games, and the amusements of the circus and amphitheatre."

Such then is the dignity and value which justly attaches to the potter's art, as a means of elucidating and illustrating ancient history; nor is the fictile ware of our Western Continent without its value in a like direction. The singular, though doubtless accidental, correspondence between the rude pottery of the most northern regions of America, and that of the ancient British Barrows, alike in material, form, and decoration, has already been noticed in this journal. De Soto and other early European travellers, note the great mastery acquired by the Natchez and other tribes in the manufacture of fine earthenware. The examples of the fictile art of the Mound Builders, in like manner disclose interesting evidence of ingenuity and artistic skill; while among the great variety of Peruvian antiquities, none are more curious than those which illustrate the inventive ingenuity of their ancient potters.

"All the moulded works of the ancient Peruvians," says Von Tschudi, "have a peculiar character which distinguishes them from those of the other American nations; a character which, by those versed in antiquities, will be recognized at first sight. Some of them bear a certain resemblance to the forms presented by the old continent; especially the most simple: such is a seated figure which has

an Egyptian type; a vase which may pass for Etruscan, and a blackish vessel that has been found, seems to be identical with those of the Celtic-Germans; so perfect, indeed, is the resemblance, that if mixed with the known remains of those countries, the archæologist would find no difference between them: but these works, so simple, and so easy to manufacture, cannot serve as a criterion to denote the special character of the works of art of any nation.

"All the skill of the Peruvian potters was laid out upon the manufacture of the Huacas, Conopas and sacred vessels which they placed with the corpses in the sepulchres. The kitchen furniture and other vessels for domestic use are very simple, and without art. The material which they made use of was colored clay and blackish earth, which they prepared so well, that it completely resisted fire, and did not absorb liquids. It seems that they did not burn the vessels, since the substance of these differed very materially from burnt clay, and judging from appearances, they dried it in the sun, after having prepared and mixed it in a manner of which we are ignorant. At this day there exist in many houses, pitchers, large jars and earthen pots of this material, and they are generally preferred for their solidity to those which are manufactured by our own potters, a proof of their superiority. The greater part of the sacred vessels, buried with the mallquis and destined to receive the chicha of sacrifice on feast days, have an enlarged neck, placed ordinarily near the handle, with a hole to pour out the liquid, and an opposite opening, for the air to escape when the vessel is filled. Many are double, and it seems that they made them thus from preference; others are quadruple, or sextuple, or even octuple, that is, the principal vessel is surrounded with regular appendages, which communicate among themselves, and with the principal vessel. The double ones were made in such perfection, that when they were filled with a liquid, the air escaping throgh the opening left for that purpose, produced sounds at times very musical: these sounds sometimes imitated the voice of the animal which was represented by the principal part of the vessel, as in a beautiful specimen we have seen, which represents a cat, and which, upon receiving water through the upper opening, produces a sound similar to the mewing of that animal. We have in our possession a vessel of black clay, which perfectly imitates the whistle of the thrush, the form of which is seen on the handle. We also preserve two circular vases, which, being filled with water, through a hole in the bottom, on being turned over, lose not a single drop, the water coming out when it is wished, by simply inclining the upper part of the vase: which proves that the Peruvian artisans had perhaps some knowledge of atmospheric pressure.

"On many of the sacred vessels there are designs and paintings, which, however, give an idea of the progress of the art of designing among the Peruvians. The architectural designs with straight lines are the only parts correct and even beautiful in appearance; but all the designs with curved lines, such as the representation of men and animals, are of little value. There is one worthy of notice which is seen very often, either painted on vessels of clay, or engraved on the arms, or worked in raised work in gold or silver, and represents a man with the arms open holding in his hands staves similar to lances (Chuqui), and the head covered with a broad cap. There is no doubt that these figures represent Deities (Huacas); others have long garments, and on the head a species of mitre, showing themselves also to be Huacas, as may be inferred from what Garcilasso relates

(Hist. Chap. 121), saying 'that the Indians, when they saw the bishop, Don F Geronimo Loayza, asked if he were the Huaca of the Christians.'"

We have spoken of Mr. Birch's work as a book of reference, and such is its real character. In it we have a somewhat unornate, (excepting in pictorial illustration,) and unseductive pair of volumes; but substantial, thorough, and nearly exhaustive, in their brief condensation of an amount of learning and research, enough to expand into whole libraries of modern popular literature. A thousand suggestive hints supply material which might have been expanded into singularily attractive pages. The colloquies, exclamatory phrases, addresses to purchaser or spectator, and frolicsome or sarcastic Iambi of the potter's inscriptions, abound with interesting illustrations to the classical scholar. Again the modern fabrications are scarcely less curious, such as that engraved by Brondsted and Stackelberg, in a fit of archæological irony; and gravely reproduced by the credulous Inghirami as a genuine antique. A modern antiquary appears running after a draped female figure called ΦΗΜΗ, or "Fame," who flies from him, exclaiming: ΕΚΑΣ ΠΑΙ ΚΑΛΕ: "Be off my fine fellow!" But the author's purpose was to produce a substantially useful, not a popular book, and in this he has fully succeeded. The references, moreover, are equally various and minute; and will doubtless guide many a laborer on the same prolific theme, to authorities, of which, but for the accuracy and the honesty of the author of this "History of Ancient Pottery," they would never have known the existence. But such writers, though they may supplement, illustrate, and paraphrase our author,—beating out his sterling ingots into acres of leaf for purposes of showy and superficial gilding,—cannot supersede Mr. Birch's "History" as an authoritative book of reference for all who appreciate the historical value of the art of the potter.

D. W.

SCIENTIFIC AND LITERARY NOTES.

GEOLOGY AND MINERALOGY.

GEOLOGICAL SURVEY OF CANADA.

The Report of Progress for the years 1853–54–55–56, of Sir W. Logan and his able colleagues, has at length been issued. The publication of the separate Reports for each of these years was unavoidably postponed until the present time, in consequence of Sir William Logan's manifold engagements in connexion with

the Paris Exposition during 1854 and 1855. The Reports thus brought out together, constitute a volume of five hundred pages, containing several outline maps, and accompanied by a quarto atlas of eleven lithographed plates, shewing the results of a series of explorations in various districts between Lake Huron and the Ottawa. In a scientific as in a practical point of view, these united Reports may be looked upon as the most valuable publication yet issued by the Survey. Not only will they sustain most fully the reputation of Canadian science beyond our borders, but they cannot fail also to awaken renewed attention to the undeveloped resources of the Province. A detailed notice of the volume, with copious extracts, will appear in the next number of the Journal.*

PERMIAN ROCKS IN THE UNITED STATES.

Some years ago, Professor Dawson—now Principal of McGill College, Montreal—announced his conviction that a large portion of the red sandstone strata of Prince Edward's Island and Nova Scotia, belonged to the Permian Epoch.† This view, although sustained by good evidence, was seemingly opposed by the assumed absence of Permian strata in the United States; the so-called New Red Sandstone of the Connecticut valley, and other districts, being then looked upon as belonging to the higher part of the Triassic or even to the Jurassic series. Some recently published fossil evidence, however, seems likely to modify this opinion (Silliman's Journal, No. 72;) and still more recently, proofs have been brought forward simultaneously by several observers—more especially by Professor Swallow of Columbia, Missouri, and by Mr. Meek and Dr. Haydon of Albany—of the actual occurrence of Permian strata in Kansas Territory. In a letter addressed by Professor Swallow to Professor Dana (Silliman's Journal, March, 1850, p. 305) several genera and species, obtained by Major Hawn, are enumerated in support of this opinion. These species are closely analogous to, if not identical with, certain well-known types from the Permian beds of Russia.

FOSSIL BATRACHIANS FROM THE COAL STRATA OF OHIO.

Professor Wyman in the last number of Silliman's Journal, has given a brief but very interesting description of three fossil batrachians discovered some time ago in the coal beds of Jefferson County, Ohio, by Dr. Newbury and Mr. Wheatly. These examples present many remarkable features. In two of the forms, however, the characters are not sufficiently complete to throw much light upon their real nature; and hence, Dr. Wyman, with a forbearance that cannot be too highly appreciated, has abstained from naming them. The third form, *Raniceps Lyellii*, is tolerably perfect. It appears to occupy an intermediate position between the tailed and the tail-less batrachians, presenting a combination of characters belonging separately to each division. Thus it shows the convex external outline of

* Since the above was in type, we have received a letter from Sir William Logan, pointing out an error of the lithographer, in the lettering of the map of Anticosti, p. 234. Sir William writes:—"*A*, *B*, *C*, and *D*, indicating the divisions of Mr. Richardson's map, are each one place out of position. The narrow division, along the north coast, should be marked *A*. The division *A*, as shown in the map, should be *B*; B should be *C*; *C* should be *D*; *D* should be *E* 1; and *E* should be *E* 2. *F* is placed correctly. Of course the base of the middle Silurian must be removed one place to the north, with the division to which it belongs."

† See Canadian Journal, New Series, Vol. I., page 43.

jaw, the lengthened vertebral column, and the two-boned fore-arm, of the Urodela; together with the non-existence of ribs, a condition characteristic of the Anoura generally, and the presence of backward-projecting jaws as in the typical family, the Ranidæ. It is to be hoped that further explorations in the Ohio coal strata may be rewarded by additional examples of these ancient and most interesting types of batrachian life.*

CHALCODITE.

Professor J. G. Brush (Sill. Journal, March, 1858) has published some new analyses of Shephard's Chalcodite from Sterling, N. Y. These analyses go far to sustain the opinion of Professor Brush, that Chalcodite and Stilpnomelane are identical. The new analyses lead apparently to the formula 2 $(RO,SiO^3)+R^2O^3$, SiO^3+3HO; in which $RO=FeO, CaO, MgO$, with traces of MnO, NaO and KO; and $R^2O^3=Al^2O^3$ and Fe^2O^3. The bases RO however, are somewhat deficient in quantity for this formula, whilst the water is in excess; but in minerals of this kind we may naturally look for a certain amount of admixture or alteration; and examples of the partial replacement of the monatomic bases (more especially) by water, are not uncommon.

SAUSSURITE, ETC.

We quote the following remarks from a letter recently addressed to us by Professor T. Sterry Hunt, of the Geological Survey:—"I have been examining lately the Euphotides of the Alps, such as Saussure and Haüy studied: not the diabase or feldspathic rocks, mistaken for saussurite, and more recently examined by Delesse and others. True saussurite, as de Saussure long since showed, has the hardness of quartz, and density of 3·3—3·4. It is nothing more than a *zoizite*, or lime-alumina epidote, with a little soda. My analyses of the saussurite of Monte Rosa agree closely with those of Boulanger, which lead equally to the formula of zoizite. The grass-green smaragdite, from the same rock, is simply a vanadiferous bronzite, like that from near Genoa, analysed by Schafhäutl. I suspect that much of what we have taken for chrome in similar minerals, is vanadium. I have found it in one serpentine from Gaspé, and I am now searching for it in others. You are, of course, aware that it was found by Ficinus in the serpentine of Zöblitz."

ALLEGED DISCOVERY OF GOLD IN WESTERN CANADA.

No little interest has been occasioned within the last few months by the alleged discovery of gold in the ferruginous sands of the north-east shore of Nottawasaga Bay. Samples of these sands, said to have been obtained from a locality about twenty miles to the north-east of Collingwood, were submitted to us in the early part of last January. In these samples, which consisted essentially of a fine granular mixture of magnetic iron-ore, red garnet, quartz, dark green and black tourmaline, zircon (?), and black spinel, we detected unmistakeable evidence of the presence of gold. Samples of the same sand, containing minute specks of gold, were also sent to our colleague, Professor Croft. The gold, although in very fine

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* We may perhaps be allowed to refer to a somewhat obscure passage in this instructive paper, which, if left unexplained, might lead to misapprehension on the part of the more general reader. In alluding to the fossil impressions with five finger-marks, referred to batrachians, Professor Wyman states that no existing batrachians have more than four fingers. The author, however, alludes here, of course, to the *fore-arm* only, as the hind limbs of most species exhibit five fingers.

particles, was readily separated by washing in an agate mortar; or by simply shaking small portions of the sand in a piece of writing paper bent into a trough, and held in a somewhat inclined position. Mr. Dewe, of Toronto, the proprietor of the land on which the auriferous sand was alleged chiefly to occur, not feeling exactly satisfied with the statements made to him from Collingwood, paid a visit to the spot, and collected personally many samples of sand from various points upon and adjacent to the district in question. In these he failed to detect gold. We have also, by the kindness of Mr. Dewe, examined the same samples. They certainly do not contain the slightest trace of that metal. We have likewise examined many other samples (in part collected by ourselves) of sand of an exactly similar character, from the islands on Lake Couchiching, the shores of the River Severn, Matchadash Bay, the north shore of Lake Huron, and the Manitoulin Islands—all of which are entirely free from any trace of gold. It is difficult, therefore, to avoid the conclusion, that the gold in these so-called "Collingwood Sands" has been placed there for the purpose of deception. Some of the minute particles, when examined under a powerful microscope, had the appearance of having been subjected to the action of a file.* If gold really occurred in the sands of this western region, the occurrence would be of great geological interest, as the iron-sands are here evidently derived from Laurentian rocks; whereas the auriferous deposits of the Eastern Townships are the detritus of metamorphosed Lower Silurian strata, belonging to the general age of the Hudson River group.

Note:—Under the head of "Circular Polarization in Cinnabar." in the last number of the Journal, the term "hemihedral" should be properly "plagihedral." In order, also, to avoid misconception, the reader is requested to add to the characters of the *Orthisidæ*, pages 159 and 160,—"No internal shelly process, properly so called: *id est*, neither loop nor spiral process." The genus *Productus*, p. 160, is stated by d'Orbigny to range from the Silurian to the Permian strata, but in all probability it does not descend below the Devonian. It is most abundant as a Carboniferous form.

THE WOLLASTON MEDALS—1858.

At the moment of going to press, Professor Wilson has placed in our hands a copy of the London Literary Gazette, announcing the awards of the Wollaston medals for the present year, by the Geological Society of London. One of these most honorable recognitions has been conferred on the distinguished palæontologist Hermann von Meyer, of Frankfort on the Maine; and the other on our no less distinguished palæontologist of the Western World, Professor James Hall, of Albany. The justice of these awards will be universally acknowledged.

E. J. C.

PHYSIOLOGY AND NATURAL HISTORY.

MAZATLAN SHELLS: MUSEUM OF THE UNIVERSITY OF TORONTO.

The Museum of the University of Toronto has recently received an accession in the department of Conchology, so interesting and important, that a short account of it may not be unacceptable to the members of the Canadian Institute.

* Since writing the above, we have found that the gold contains *copper*. Of its origin consequently, there can be no doubt.—E. C. J.

In addition to the valuable Canadian collections made by Dr. Boys, with contributions from Dr. Bird, of Oshawa, and the land and fresh-water shells of Germany and of Southern Europe, presented by Dr. Croft: Professor Hincks brought over with him a set of illustrations of genera obtained from the late Mr. Sowerby; and many valuable tropical shells were presented by Mrs. Dall, a lady then resident in Toronto. To these have been added an extensive series, including some fine specimens purchased from an eminent dealer in Boston, U.S.; and one or two friends, particularly Professors Wilson and Chapman, have contributed useful additions. Mr. Bland, of New York, has also kindly furnished a series of North American species, with some land shells from other localities.

It will thus appear that the Conchological department was by no means in a low condition, when the attention of the Professor of Natural History was called to the fact that a valued friend, the Rev. P. P. Carpenter, of Warrington, England, had purchased the principal part of a fine collection, the result of several years' labour made at Mazatlan, in Mexico, opposite the southern point of California, by M. Frederic Reigen, a Belgian gentleman, who died just as he had completed them, and by whose executors they were sold in Liverpool—first to a wholesale dealer, and by him to Mr. Carpenter. The latter gentleman generously resolved to present to the British Museum a full series, including many specimens of each of all the species obtained, and proposed then to issue, by subscription, sets of the remainder to those who might desire to obtain them. The matter coming to the knowledge of Professor Hincks, he was of opinion that shells illustrating the western coast of this continent, would have a special interest for us in Canada, and the subscription appearing moderate in comparison to the usual charges, he recommended them for purchase. Mr. Carpenter was good enough—besides expending for the University collection a small additional sum in selected specimens of known locality—to present to the Museum above four hundred specimens from his own collection, all with their localities carefully marked; so that the whole addition made to the University cabinet is very extensive.

The circumstances which may be regarded as giving special interest to the Mazatlan shells are:

1. That they furnish trustworthy data for inquiries respecting the geographical distribution of mollusca. All who have studied the subject know the difficulty of obtaining authentic information on this subject. Even scientific collectors are often very careless in separating the productions of different localities; and when it is considered how numerous are the places at which ships may touch in long voyages, at all of which something may be obtained, and the practice of purchasing collections often brought together from remote points, we cannot wonder that specimens, introduced in the way of trade, are difficult to trace to the place in which the animals lived. Nor is this all. When shells fall into the hands of dealers they are are strangely mixed, and the accounts given of them are not always strictly truthful. A person seeking shells from a particular region may frequently obtain more than ever really belonged to it. M. Reigen appears to have laboured diligently in collecting the shells of the interesting spot which he visited, but not to have at all sought to extend his collection by miscellaneous purchases; and the history of what he had brought together, subsequent to his death, is well known, so that there is little room for error.

2. The specimens of each species are in most instances numerous, showing the

amount and limits of the variations to which species are subject: a point of some importance, upon which the one or two examples, possibly from various places, found in most collections, throw no light. M. Reigen seems never to have been satisfied that he had got sufficient of one kind; and the gentleman into whose hands his stores have fortunately fallen, fully estimating the value of researches respecting the true limits of species, and the difficulties under which ordinary naturalists labour, has, not only in his noble present to the British Museum, but as far as was possible in all the collections sent out, been careful to supply good series of specimens.

3. The condition of the specimens in this collection is very remarkable. They are as they were taken from the water, without having undergone any process of cleansing or polishing. Many of the gasterapods have their opercula. The lamellibranchiata appear with their hinges undetached, and the surfaces in their original state. Even a few such objects in a large collection are invaluable, as a source of instruction, and contribute to render the ordinary specimens far more useful.

4. This collection contains a considerable number of new species. The locality was an unexamined and remarkably favourable one—in a tropical climate, and at the junction of a great gulf with the ocean. The collector devoted adequate time and great diligence to his work, and his success was fully equal to what we might expect in such circumstances.

We must regret that M. Reigen did not live to make use of his own accumulated stores, and to communicate the peculiar information which he must have gained in the course of their acquisition: but they have fallen into excellent hands. Mr. Carpenter's donation to the National Museum—considering its intrinsic value pecuniarily as well as scientifically, and the labour involved in its preparation, and coming too from a hard-working professional man, with very limited means—must be accounted a commendable example of public-spirited generosity; and his dealings with the Toronto University, even putting out of the question the very handsome present which he took the opportunity of contributing to our rising Museum, are marked by a liberality which deserves to be felt and acknowledged.

At a meeting of the Canadian Institute, in the month of December last, Prof. Hincks exhibited to the members present a series of specimens illustrating his remarks in the previous paragraphs on the collections of Mazatlan shells. It may be stated here, that the collection acquired for the University Museum, contains about two hundred and thirty distinct species, many of them new, and a large proportion illustrated by good series of specimens. The whole number of species described as occurring at Mazatlan, approaches seven hundred; but of these a great many were unique,—not a few described from fragments—a good many others so very rare as to allow no specimens for distribution—and some were not contained in the Liverpool collection. Many, too, are microscopic, which makes the supply more uncertain. On the whole, the collection is rich as a local group, and adds greatly to the value of the conchological cabinet of the University Museum.

W. H.

CANADIAN FLORA; NEIGHBOURHOOD OF TORONTO.

Having noticed several European plants naturalized in this country (introduced no doubt with grass seed), which are not recorded by Dr. Gray in his valuable manual, I am desirous of placing them on record, and I avail myself of the opportunity to offer a few general remarks on the Canadian Flora, and the state of our knowledge respecting it. I shall confine myself at present to Phænogamous plants and ferns, with their allies. Mosses, Liverworts, Lichens, Algae, and Fuci, are studied by a much more limited class, and our knowledge of the limits of species is in a much less advanced state; we will not, therefore, at present, venture any opinion respecting them.

Dr. Gray enumerates 2426 species of Phænogamous plants and ferns, as constituting the Flora of the Northern United States, rejecting from this number the Southern forms and the maritime plants, with all those which, from any cause appear to be unknown in Canada about 1000 remain as constituting the Flora of Canada, such as we may expect to find it. Some peculiar forms may be expected northward and eastward, but they can be supposed to make but a very small numerical addition.

I have kept a list of the plants found by me near Toronto, and in a few occasional country excursions, and find the number recorded to be just under 600. Here it is to be considered that, besides the comparatively small space examined, there are several numerous families which have not yet been made a subject of particular examination, and which could hardly fail to add another hundred species. In the number of the *Canadian Journal* for April, 1854, is inserted a list of indigenous plants found in the neighborhood of Hamilton, by Dr. Craigie and Mr. W. Craigie, which appears to be carefully drawn up, though as it seems to note the results of one season's botanizing, there are of course many omissions. This list contains 362 species, of which 15 are not found in my list. The great difference is due partly to oversight, as the list is apparently only the result of one year's botanizing, and partly to the circumstance that most trees and all Cyperaceous and Graminaceous plants have been entirely omitted.

A complete Flora of Canada cannot be expected for many years; but it appears to me that a tolerably correct and sufficiently useful list of the plants of Western Canada might now be formed, and would include a little above 1000 species of Phænogamous plants and ferns. Even conjecturally the limits may be marked out with sufficient accuracy for practical use, and a few journeys at a favorable season, or the opportunity of examining a few carefully formed local lists, would now settle everything excepting a small number of doubtful species.

Comparing our Flora with that of Great Britain we find we have both less variety upon the whole, fewer successive changes with the progress of the season and less difference of districts. We have a few plants that are only to be found in rocky districts, which are, of course, more limited in their range; but excepting these there is a remarkable conformity in the productions of the different parts of our country. This, with the allowances required for mountain ranges and the sea-coast, as well as for the gradual introduction, as we proceed southward, of new forms, is found also in the Flora of the United States, and is characteristic of the vast continent we inhabit. Our vernal Flora is one of great variety as well as beauty and interest. We have only to regret that it is so transient. At other

seasons we make a less favorable appearance, and it seems easy for the botanist to acquaint himself with all the species within his reach; excepting that as autumn advances the numerous and difficult species of the great genera Aster and Solidago, of which this continent is the special home, may exercise his patience and discriminating skill. Among the plants of peculiar interest from the nature of their distribution in this country, which I have had the good fortune to meet with, I would mention two rare ferns, *Aspidium Lonchitis*, a scarce British fern, which has a narrow range over this continent, and *Scolopendrium Officinale*, a common British plant, but here very rare, both of which I found on the limestone rocks at Owen's Sound. The following are the plants not found in Gray's list which I have noticed as naturalized in this neighborhood, and which as familiar objects in that country which we always speak of as *Home*, it is pleasant to add to our list:

Papaver Rhœas, Common Poppy.

Lychnis flos cuculi, Ragged Robbin.

Lychnis vespertina, Evening scented white campion.

Hieracium pilosella, Mouse ear hawkweed, at Altamore, near Woodstock, North Oxford, C. W., the residence of Thos. J. Cottle, Esq.

Rumex acetosa. Sorrel.

Veronica Buxbaumii. I have not withdrawn this pretty speedwell from the list, although since I made my note it has been introduced by Dr. Gray into his new edition. It is found near Toronto.

Cynosurus cristatus, Dog's-tail grass.

I withhold my list only because I have reasonable expectations of greatly increasing it during the coming season.

NOTE.—Since the above was in type, I have seen in the Canadian Naturalist and Geologist for February, a list of indigenous plants found growing in the neighborhood of Prescott, C. W., by B. Billings, Junr. Setting aside a few mosses and Hepaticæ, the number contained in this list is 407, all of which, excepting two or three, are also found in my list. The supplement which the author promises. will probably render the difference in extent much less considerable.

W. H.

ENGINEERING AND ARCHITECTURE.

AN IMPROVED FLOOR TO SECURE GROUND FLOORS AGAINST WET, HEAT, ETC.

At a meeting of the Canadian Institute on the 10th of April, M. Alphonze Coulon, C. E., read a description of an improved mode of flooring, originally introduced by him in Paris, of which the following is an abstract:

It consists of a level stratum of asphalte cement covering the area of the rooms, laid about ½ inch in thickness, and before its laying the joists for the support of the boarding have been fitted in a hollow full of asphalte. Such is the improved floor introduced at Paris, in 1852, for the entrepot of Cereales, which M. Coulon superintended, and after several experiments of the same kind he was led to the following conclusions:

1. The wet is entirely excluded.

2. The peculiar advantages of this floor compared with the kind, the battens of which rest directly over the asphalte, cannot be over estimated.

In fact, the last one being composed of battens fitted only in the asphalte, its surface is very rough for walking, and presents many inequalities to retain the wet, especially when any weight is placed in circulation upon it, as the battens are often driven out. But with the improvement now described all these objections are removed, and as the battens are ploughed, tongued and nailed on the joists, they cannot fail to produce a compact and solid floor. Also, the distance between the asphalte and the floor being less than half an inch, there is a certain degree of elasticity, and this is sufficient for the ventilation of the floor, but too narrow for the passage of mice or rats.

By putting sand in this empty space, the passage of the sound (in the case of an upper floor) will be effectually arrested.

This improvement offers, also, the advantage of avoiding the use of masonry work for fitting the joists, which, in that case increases considerably the height of the floor; and thus the cost is considerably diminished. For the joists being all along well fitted in an asphaltic bath, it is then advisable to diminish their thickness and that of the floor.

Further, if we desire to secure complete dryness for the first story or the cellar, we have only to re-cover all over the inner walls with a combination of wood and asphalte, similar to the improved floor already described, which forms a waterproof stratum.

CANADIAN INSTITUTE.

Session—1857-58.

SIXTH ORDINARY MEETING—30*th January*, 1858.

The Hon. Chief Justice Draper, C.B., President, in the Chair.

I. *The following Gentlemen were elected Members:*

Arthur Harvey, Esq., Hamilton.
Arthur R. Sowdon, Esq., Toronto.
William Hay, Esq., Architect, Toronto.
A. C. Messer, Esq., Civil Engineer, Toronto.
Chilion Jones, Esq., Civil Engineer, Toronto.
Charles J. Carroll, Esq., Toronto.
William Davidson, Esq., Berlin.
Joseph Bouchette, Esq., Dep'y Surv. Gen., Toronto.

II. *The following Donations to the Library were announced, and the thanks of the Institute voted to the donors:*

From Messrs. Crosby, Nichols & Co., Publishers, Boston.
Mabel Vaughen.
American Almanac, 1858.

III. *The following Papers were read:*

1. By Thomas Hector, C. E.:
"Scale for computing areas of irregular figures."

2. By Col. Baron de Rottenburg, C. B.:
"Observations made at Toronto on Solar Spots in the month of January, 1858."
3. By Prof. Croft, D.C.L.:
"On the purification of Sulphuric Acid for toxicological investigations."
4. By S. Fleming, Esq., C.E.:
"On a method of launching large vessels."

SEVENTH ORDINARY MEETING—6th *February*, 1858.

The Hon. Chief Justice DRAPER, C.B., President, in the Chair.

I. *The following Gentlemen were elected Members:*

JOHN FLEMING, Esq., Toronto.
WILLIAM HUTTON, Esq., Toronto.

Corresponding Members.

Capt. A. NOBLE, Royal Artillery.
Rev. G. C. IRVING, M. A.

II. The President announced that a Special Meeting would be held on the second Saturday from this date, to take into consideration, on the recommendation of the Council, the addition of the following clause to Rule 4 of Sec. IV. of the Regulations:

"And it shall be the duty of the Secretary to furnish a printed list of persons nominated to office (with the proposer and seconder of each) to every country member who shall apply to him in writing, signed by himself, for the same; and the Secretary shall produce the said application at the time of election, otherwise the vote shall not be valid."

III. *The following Donations to the Library and Museum were announced, and the thanks of the Institute voted to the donors:*

1. From Thomas Henry, Esq.
Logan's Geological Report, 1853–1856, together with Maps.
2. From Major Lachlan.
A preserved specimen of the *Agama Cornuta*, popularly styled the Horned Frog, of Mexico.

IV. *The following Papers were read:*

1. By Major Lachlan:
"A communication accompanying a specimen of the *Agama Cornuta*, with remarks on the Natural History of the animal."
2. By Rev. J. McCaul, LL. D.:
"On Latin inscriptions found in Great Britain." Part II.

EIGHTH ORDINARY MEETING—13th *February*, 1858.

Col. BARON DE ROTTENBURG, C. B., Vice-President, in the Chair.

I. *The following Gentleman was elected a Member:*

ROBERT CLELAND, Esq., Toronto.

II. *The following Papers were read.*

1. By S. Fleming, Esq., C.E.:
"Note on an improved kind of Rail.

2. By Prof. J. B. Cherriman, M.A.:

"On the application of Acoustics to Public Buildings, as illustrated in the Lecture Room of the Smithsonian Institution at Washington.

NINTH ORDINARY MEETING—20*th February*, 1858.

Hon. Chief Justice DRAPER, C.B., President, in the Chair.

I. *The following Gentlemen were elected Members:*

S. DERBISHIRE, Esq., Toronto.
THEODORE CLEMENTI, Esq., Peterboro.
Capt. RETALLACK, Assist. Military Sec'y, Toronto.

II. The Secretary having read the notice of the proposed addition to Rule 4 Sec. IV. of the Laws, as recommended by the Council, on a remit to them from a former meeting,—It was moved by Dr. Wilson, seconded by Mr. Langton, and carried, that such addition be now made.

III. *The following Donation to the Museum was announced, and the thanks of the Institute voted to the donor:*

From C. Unwin, Esq., D.P.L.S.

Two specimens of the Eggs of the great Northern Diver, from Gull Lake.

IV. *The following Papers were read:*

1. By Prof. Cherriman, M.A.:

"Description of the Observatory at St. Martin's, C.E. From notes furnished by Prof. Smallwood."

2. By Col. Baron de Rottenburg, C.B.:

"Some Astronomical Notes."

3. By Rev. Prof. Kendall, M.A.:

"Geometrical Notes."

TENTH ORDINARY MEETING—27*th February*, 1858.

JOHN LANGTON, M. A., Vice-President, in the Chair.

I. *The following Gentlemen were elected Members:*

CHARLES SPROUTT, Esq., Toronto.
DOUGLAS S. SUTHERLAND, Esq., Guelph.

II. Dr. Wilson laid on the table the Canadian Journal for March, now ready for distribution, and drew the attention of Members to the Catalogue of the Institute Library, which accompanied it. For this carefully prepared catalogue the members are indebted to the zeal of the Librarian, Prof. Croft.

A vote of thanks was unanimously passed to Professor Croft, for the diligence and care bestowed in the rearrangement of the books, and the compilation of the Library Catalogue.

III. *The following Donations to the Library and Museum were announced, and the thanks of the Institute voted to the donor:*

From J. F. Smith, Esq., Junior.

LIBRARY.—Descriptive Guide to the Museum of Practical Geology, London.
" Hindostanee Interpreter, &c., &c.

MUSEUM.—Specimen of Fossil Bone from the late Dr. Buckland's collection.

IV. *The following Papers were read:*

1. By M. A. Coulon, C.E.:
"On the calculation of Road and Railway Excavations and embankments."
2. By Prof. Henry, LL.D., Smithsonian Institution, Washington:
"On Climatology." Read by Prof. Cherriman, M.A.
3. By Prof. Wilson, LL.D.:
"On the true value of the Colon as a mark of Punctuation."

ELEVENTH ORDINARY MEETING—*6th March*, 1858.

The Hon. Chief Justice DRAPER, C.B., President, in the Chair.

I. *The following Gentlemen were elected Members:*

W. ELLIS, Esq., Civil Engineer, Prescott.
JESSE THOMPSON, Esq., Toronto.

II. *The following Donations to the Library were announced, and the thanks of the Institute voted to the donors:*

From the Regents of the University of the State of New York.
Census of the State of New York. 1 Vol.
Historical documents relating to the State of New York. Vol. X.

III. *The following Papers were read:*

1. By the Rev. D. Inglis, Hamilton:
"On the relation of Quantity to the Æsthetic sentiment."
2. By the Rev. Prof. Hincks, F.L.S.:
"Considerations respecting anomalies of Vegetable Strucutre, their causes, scientific importance, proper arrangement, and some of the conclusions derived from them or supported by them.

TWELFTH ORDINARY MEETING—*13th March*, 1858.

Col. BARON DE ROTTENBURG, C.B , Vice-President, in the Chair.

I. *The following Gentlemen were elected Members:*

FRANCIS C. DRAPER, Esq., Toronto.
REV. W. CHECKLY, B.A., Barrie.
ALEX. KELLOR ROY, Esq., Toronto, (Junior Member.)

II. *The following Donation to the Library was announced and the thanks of the Institute voted to the donor:*

From the Hon. Chief Justice Sir John B. Robinson, Bart.
"Contributions to the Natural History of the United States of America," by L. Agassiz. Vols. I. and II.

III. *The following Papers were read:*

1. By Prof. Hind, M.A.:
"On ancient Lake Ridges and Beaches in the Valley of the Red River."
2. By T. Sterry Hunt, Esq., Montreal:
"Considerations on the Theory of Igneous Rocks."
3. By Col. Baron de Rottenburg, C.B.:
"Remarks on the spots now visible on the Sun's disc."

THIRTEENTH ORDINARY MEETING—20*th March*, 1858.

Col. Baron de Rottenburg, C.B., Vice-President, in the Chair.

I. *The following Gentlemen were elected Members:*

James McCutcheon, Esq., Toronto.
Rev. Vincent Clementi, B.A., Peterboro, C.W.
W. S. Macdonald, Esq., Gananoque, C.W.
J. S. Playfair, Esq., Toronto.

II. *The following Papers were read:*

1. By Rev. Prof. Hincks, F.L.S:
"On the Classification of Mammalia."
2. By Prof. E. J. Chapman:
"On a New Trilobite from Canadian Rocks, with some additional remarks on the *Asaphus Canadensis.*"
3. By Prof. Croft, D.C.L.:
"On some compounds of Palladium."

FOURTEENTH ORDINARY MEETING—27*th March*, 1858.

Col. Baron de Rottenburg, C.B., Vice-President, in the Chair.

The following Papers were read:

1. By the Rev. J. McCaul, LL.D.:
"On Roman Military and Naval Epitaphs."
2. By T. Henning, Esq.:
"Inquiry into the means of rendering our Educational System applicable to the social condition of large cities."

FIFTEENTH ORDINARY MEETING—10*th April*, 1858.

John Langton, M. A., Vice-President, in the Chair.

I. *The following Donations to the Library and Museum were announced, and the thanks of the Institute voted to the donors:*

1. From George Brown, Esq., M.P.P.
Library.—Logan's Geological Survey, 1853–1856, with Maps. Two Vols.
2. From And. Russell, Esq., Assistant Commissioner Crown Lands Department.
Library.—Logan's Geological Survey, 1853–1856, with Maps. Two Vols.
3. From Major Lachlan, Cincinnati, Ohio.
Museum.—Miscellaneous specimens of Minerals, and other objects. Sixty parcels, numbered, with descriptive catalogue.
4. From A. Macdonald, Esq., Alexandria, Lochiel, Glengary.
Curious Copper Medal.

II. Professor Chapman deposited with the Institute, on the part of T. Sterry Hunt, Esq., of Montreal, a sealed packet, containing a notice of some researches to be communicated to the Institute, hereafter, in a more complete form.

III. *The following Papers were read:*

1. By Rev. Prof. Young, M.A.:

"On the impossibility of representing by Algebraical functions the roots of Equations of a higher order than the fourth."

2. By F. W. Cumberland, Esq., C. E.:

"Notes on the paper read by Mr. Henning at the last meeting, on our Educational System."

3. By M. A. Coulon, C.E.:

"On an improved floor, specially applicable for ground floors."

SIXTEENTH ORDINARY MEETING—17*th April*, 1858.

Col. Baron de Rottenburg, C.B., Vice-President, in the Chair.

I. *The following Gentlemen were nominated for election as Members:*

Thomas Reynolds, Esq., M.D., Brockville, C.E.

J. J. Burrows, Esq., Kingston.

The following Gentlemen were nominated for election as Junior Members:

G. T. Carruthers, Esq., Trinity College, Toronto.

C. J. Bethune, Esq., " " "

II. *The following Paper was read:*

By F. W. Cumberland, Esq., C.E.:

"Notes on the course of the Western Trade, Eastward to the Atlantic."

III. Messrs. Spreull, and Spratt were nominated Auditors for the present year.

IV. The Chairman announced this meeting as the closing one, and took occasion to congratulate the Institute on having thus brought another session to a successful termination. The communications read before the meetings had been of a highly varied character, and while he believed that they had in some respects been less attractive to many than those of some previous seasons, he was inclined, from his own observation, to look upon this as no unfavorable aspect. The communications of this year would, he believed, be found to have included more of a strictly scientific character than in any previous session; and if some of them were on that account less calculated to interest a popular audience, they would be found to maintain and extend that scientific character which it was most desired that the Journal of the Canadian Institute should assume. The prospects of the Society were now, in all respects, most encouraging. Their library had been greatly extended, by valuable additions of a strictly scientific character, both by purchase and gift: and its utility had been largely increased through the exertions of their efficient Librarian, Prof. Croft, by whom it had been systematically classified, arranged and catalogued, during the session now brought to close.

In concluding, the Vice-President invited the attention of the members during the approaching summer to such subjects of interest in science, literature, and the mechanical and industrial arts, as may furnish materials for valuable communications to future meetings, and contributions to the Journal of the Institute. He then declared the adjournment to the 1st Saturday in December.

MONTHLY METEOROLOGICAL REGISTER AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—FEBRUARY, 1858.

Latitude—43 deg. 39.4 min. North. Longitude—5h. 17m. 33s. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°. 6 A.M.	2 P.M.	10 P.M.	Mean.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Mean Temp. + or − of the Average	Tens. of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Resul't. Direction.	Velocity of Wind. 6 A.M.	2 P.M.	10 P.M.	Result'.	M'N	Rain in inches.	Snow in inches.
					°	°	°	°	°												°							
1	29.787	29.628	29.403	29.5768	23.9	29.0	29.7	27.63	+ 3.75	.096	.118	.152	.120	.74	.74	.92	.78	S S E	N N E	E b N	N 80 E	5.0	19.0	22.2	15.63	16.06	...	6.0
2	.071	.024	.271	.1370	31.0	33.9	30.3	31.97	+ 3.12	155	180	127	156	89	92	75	86	E b S	S W	W b S	S 70 W	9.2	6.0	14.0	7.49	9.35	inap.	0.5
3	.508	.558	.715	.6122	30.3	32.8	21.6	27.52	+ 3.75	150	164	061	129	89	87	70	82	W S W	S W b W	W	S 69 W	13.5	14.0	18.0	11.67	12.06	...	0.5
4	.757	.731	.743	.7430	10.0	24.5	13.7	15.40	− 8.28	054	078	054	063	78	59	67	71	Calm.	W b S	W b S	S 70 W	0.0	9.3	3.0	4.21	4.29	...	...
5	.693	.644	.718	.6962	1.4	23.9	15.1	13.65	− 9.93	020	067	074	058	43	52	86	64	Calm.	W S W	W b S	S 75 W	0.0	8.0	11.0	8.19	8.30	...	...
6	.812	.755	.565	.6970	19.1	25.2	28.3	24.57	+ 1.05	090	098	137	109	87	72	88	81	W b S	S W b S	S	S 30 W	12.2	7.5	8.2	8.46	9.75	...	0.4
7	.517	.583	—	—	31.3	30.6	—	—	—	166	152	—	—	95	89	—	—	W S W	W S W	W b S	S 82 W	13.3	11.5	9.0	11.91	12.83	...	0.2
8	.828	.824	.774	.8082	19.8	23.0	18.7	20.10	− 3.27	095	092	075	083	90	78	75	77	N W b W	Calm.	N N W	N 16 W	6.0	0.0	1.5	1.88	2.03	...	0.4
9	.555	.115	28.994	.1972	20.9	30.1	22.0	24.37	+ 1.10	095	144	110	118	85	86	93	89	N N E	E S E	W b N	S 72 E	6.0	3.5	7.2	0.67	3.40	...	5.0
10	.083	.325	29.540	.3403	23.0	10.4	5.0	11.58	−11.68	106	055	049	062	86	78	90	82	S W b W	W b N	W	S 86 W	18.6	26.6	18.2	21.21	21.80	...	0.5
11	.657	.765	.816	.7530	3.2	4.3	2.8	2.77	−20.50	047	046	042	043	95	86	83	86	S W b W	N W b W	W b N	S 76 W	15.0	2.2	0.5	4.35	4.63	...	...
12	.806	.846	.924	.8667	6.1	19.8	11.3	11.80	−11.45	048	070	061	057	83	65	83	77	W b S	Calm.	W b N	N 12 W	4.0	0.0	6.5	2.87	5.57	...	...
13	.944	.788	.692	.8035	4.3	10.4	14.4	9.67	−13.58	030	045	070	052	55	63	83	72	N E b N	N E b E	E b N	N 58 E	15.5	14.5	24.2	16.68	17.29	...	6.0
14	.487	.604	—	—	9.0	12.6	—	—	—	054	066	—	—	82	86	—	—	N E b N	N b W	N N W	N 8 E	13.5	5.5	0.5	6.00	6.96	...	2.5
15	.818	.908	.887	.8695	9.3	17.8	19.1	15.67	− 7.58	062	082	071	067	93	83	69	76	N N W	Calm.	W b N	N 66 W	15.0	0.0	2.0	4.48	5.16	...	...
16	.794	.802	.915	.8427	14.0	11.3	−0.1	7.52	−15.85	062	045	037	047	76	61	85	75	N W b N	N N W	N W	N 39 W	10.0	14.0	12.0	12.10	12.26	...	...
17	30.028	.982	.929	.9815	−6.6	9.0	2.4	1.60	−21.75	022	048	043	037	66	73	90	73	N W	W b N	N W	N 50 W	7.5	4.0	6.2	3.97	4.38	...	...
18	29.885	.858	.894	.8862	6.1	10.0	3.2	6.15	−17.28	037	039	043	039	62	57	83	67	W N W	N N W	N	N 3 E	1.8	6.6	8.2	6.93	7.37	...	...
19	.863	.760	.641	.7447	1.4	9.7	9.3	6.75	−16.78	041	046	062	050	88	67	94	84	N E b N	E N E	N E	N 44 E	17.0	16.2	17.8	16.06	16.30	...	3.0
20	.537	.524	.491	.5120	11.1	15.5	10.4	13.33	−10.28	061	076	057	068	85	86	80	84	N N E	Calm.	W S W	N 84 W	13.8	0.0	2.5	2.79	6.70	...	0.5
21	.391	.366	—	—	20.9	24.1	—	—	—	095	097	—	—	85	74	—	—	S W b W	N W b N	W	N 80 W	13.0	13.5	5.5	9.79	11.97	...	0.2
22	.799	.802	.842	.8222	11.8	16.2	11.8	12.43	−11.38	063	061	061	059	86	67	81	77	N W b W	W N W	N	N 51 W	4.4	6.0	2.0	3.10	3.64	...	...
23	.961	30.057	.941	.9913	1.0	17.6	12.9	11.50	−12.43	056	076	057	060	76	79	73	77	N	S b E	W S W	S 60 W	1.0	1.5	5.5	2.34	3.52	...	...
24	.755	29.554	.519	.5980	6.8	25.7	24.5	20.55	− 3.58	049	095	088	084	81	68	67	74	W b S	S W b S	W	S 45 W	3.9	19.3	5.0	9.04	9.61	...	...
25	.458	.485	.602	.5205	25.6	31.0	22.0	26.46	+ 2.15	110	091	110	103	80	52	93	78	W b S	W N W	N W b W	N 60 W	7.0	15.5	6.8	6.44	7.18	...	0.1
26	.632	.586	.446	.5446	15.5	30.3	30.3	26.53	+ 2.00	069	108	185	109	79	64	79	73	Calm.	S b W	S S W	S 26 W	0.0	11.2	11.8	11.19	11.28	...	...
27	.253	.274	.353	.3018	33.2	40.7	33.2	36.07	+13.35	166	146	161	152	87	57	69	66	S S W	S W b S	W b S	S 70 W	12.2	8.6	5.5	4.54	9.18	...	0.1
28	.330	.290	—	—	32.2	34.2	—	—	—	171	172	—	—	93	87	—	—	N b W	N	N W b N	N 25 W	10.0	6.2	1.0	7.14	7.55	...	0.8
M	29.6797	29.6499	29.6506	29.6606	18.42	20.92	16.54	16.96	−6.69	.074	.084	.081	.080	.80	.71	.81	.77	...	...	...	...	8.07	9.11	8.48	...	9.19	Inap.	26.7

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR FEBRUARY.

Highest Barometer........................ 30.060 at 4 p. m., on 23rd } Monthly range=
Lowest Barometer .... 28.940 at 8 p. m., on 9th } 1.120

Self-regist'ing Thermom.
- Maximum Temperature........... 42°.4 on p. m. of 27th } Monthly range=
- Minimum Temperature........... —7°.3 on a. m. of 17th } 49°.7
- Mean maximum Temperature .... 24°11 } Mean daily range=
- Mean minimum Temperature .... 10°85 } 13.26
- Greatest daily range .... 25°6 from a. m. to p. m. of 12th.
- Least daily range................. 3°2 from p. m. of 15th to a. m. of 16th.

Warmest day......... 27th ... Mean temperature......... 38.07 } Difference = 36°47.
Coldest day........... 17th ... Mean temperature......... 1°60 }

Maximum Radiation. { Solar................................ 61° 0 on p. m. of 27th, } Monthly range=
{ Terrestrial........................ —15°.0 on a. m. of 17th. } 76°0

Aurora observed on 6 nights, viz., on 12th, 14th, 15th, 16th, 17th and 18th.
Possible to see Aurora on 11 nights; impossible on 17 nights.

Snowing on 16 days,—depth 26.7 inches; duration of fall 96.0 hours.
Raining on 1 day,—depth inapp. inches; duration of fall 0.5 hours.

Mean of cloudiness = 0.69.
Most cloudy hour observed, 2 p. m., mean = 0.75; least cloudy hour observed, midnight, mean, =0.62.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
1986.02	1324.35	1244.28	3302.41

Resultant direction N. 72° W.; Resultant Velocity 3.22 miles per hour.
Mean velocity.......................... 9.12 miles per hour.
Maximum velocity .... 31.2 miles from noon to 1 p. m., on 10th.
Most windy day....................... 10th...Mean velocity 21.80 miles per hour.
Least windy day .... 8th...Mean velocity 2.03 ditto.
Most windy hour ... 11 a.m. to noon ....Mean velocity 10.69 ditto. } Difference
Least windy hour ... 9 to 10 p. m............Mean velocity 8.07 ditto. } 2.62 miles.

1st. Clouds of dust flying in Toronto during the afternoon. Perfect Solar Halo at 2 p.m.
3rd. Zodiacal Light very bright at 7 p. m.
10th. Very Stormy, cold day.
11th. Zodiacal Light bright and well defined during the evening.
13th. Stormy day. Snowing and drifting heavily.
18th. Perfect Lunar Halo from 7 p. m.
20th. Corona round the Moon at 9 p. m.
22nd. Corona round the Moon at midnight.
23rd. Lunar Halo, 6 to 8 p. m. Corona at 10 p. m.
26th. Lunar Halo at 9 p. m.

The mean Temperature of February 1858 was 5°68 below the average of 19 years; and although the quantity of Rain was inappreciable, the amount of the Moisture almost reached the average, as the fall of Snow was 8.84 inches in excess of the usual depth.

The mean velocity of the Wind was 1.37 miles per hour above the average of 11 years, and the Resultant direction and velocity from 1848 to 1858 inclusive were respectively N 71° W. and 2.96 miles.

COMPARATIVE TABLE FOR FEBRUARY.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	M'n.	Diff. from Aver.	Max. ob'd.	Min. ob'd.	Range.	No. of days.	Inch's.	No. of days.	Inch's.	Resultant. Direction.	Resultant. V'y.	Mean Force or Velocity.
1840	28.0	+5.3	49.1	+ 8.3	40.8	8	1.475	6	...	...	...	....
1841	22.4	—0.3	43.4	— 0.3	43.7	1	0.000	9	...	...	...	0.61 lbs.
1842	26.9	+4.2	48.7	+ 2.5	46.2	8	3.625	9	...	...	...	1.03
1843	14.5	—8.2	37.5	—10.2	47.7	1	0.475	21	14.4	...	...	1.05
1844	26.0	+3.3	47.1	— 0.4	47.5	4	0.430	7	10.0	...	...	0.43
1845	26.0	+3.3	46.6	— 3.9	50.5	5	...	9	19.0	...	...	0.99
1846	20.4	—2.3	41.4	—16.2	57.6	0	0.000	13	46.1	...	...	0.65
1847	21.5	—1.2	42.2	— 1.0	43.2	2	0.550	13	27.3	...	...	0.69
1848	26.6	+3.9	46.9	— 0.6	47.5	4	0.775	8	10.8	N 65° W	2.53	5.69 mls.
1849	19.5	—3.2	41.1	— 9.2	50.3	2	0.240	13	19.2	N 41° W	1.48	6.58
1850	26.0	+3.3	49.2	+ 1.3	47.9	7	1.235	9	23.1	N 80° W	3.43	7.61
1851	27.6	+4.9	50.2	+ 1.3	48.9	7	2.600	4	2.4	N 64° W	1.99	6.94
1852	23.4	+0.7	41.2	— 3.2	44.4	3	0.650	11	13.0	S 75° W	3.34	6.42
1853	24.1	+1.4	43.4	— 0.6	44.0	4	1.030	15	12.6	N 49° W	2.51	7.29
1854	21.1	—1.6	42.7	— 5.7	48.4	5	1.460	15	18.0	N 7° E	1.68	6.91
1855	15.4	—7.3	37.3	—25.0	62.3	2	1.770	14	21.8	N 40° W	4.34	8.17
1856	15.7	—7.0	35.3	—18.7	54.0	0	0.000	8	9.7	N 81° W	7.70	10.71
1857	28.5	+5.8	51.2	— 5 9	57.1	11	3.050	11	11.7	S 78° W	3.68	9.82
1858	17.0	—5.7	40.9	— 6.6	47.5	1	inap.	16	26.7	N 72° W	3.22	9.12
M	22.66	...	43.97	—4.95	48.92	3.9	1.076	11.1	17.86	...	...	7.75 mls.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST—MARCH, 1858.

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 min. 33 sec. West. Elevation above Lake Ontario, 108 feet.

Day	Barom. at temp. of 32°.				Temp. of the Air.				Mean Temp. + or — of the Average	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resultant Direction.	Velocity of Wind.					Rain in Inches.	Snow in Inches.
	6 A.M.	2 P.M.	10 P.M.	MEAN	6 A.M	2 P.M	10PM	ME'N		6 A.M	2 P.M	10 P.M	M'N	6 A.M	2 P.M	10 P.M	M'N	6 A.M.	2 P.M.	10 P.M.		6 A.M	2 P.M	10PM	Result't.	ME'N		
					°	°	°	°	°												°							
1	29.424	29.485	29.560	29.4897	23.8	21.2	10.8	18.28	— 6.93	.103	.066	.060	.074	.81	.57	.90	.74	W N W	N W b N	N W b W	N 44 W	14.5	11.0	11.5	12.93	13.25	......	...
2	.504	.453	.581	.5180	8.6	13.1	3.7	7.92	—17.50	.053	.037	.042	.043	.82	.46	.81	.70	N W	N W b N	W N W	N 60 W	12.0	9 5	3.0	8.34	8.50	......	...
3	.598	.592	.792	.6687	2.1	15.5	6.4	7.07	—18.65	.039	.072	.044	.050	.80	.82	.75	.79	W N W	W S W	N W	N 69 W	0.2	8.9	9.0	6.76	7.22	......	0.2
4	.868	.890	.936	.9153	—1.5	12.3	3.9	4.93	—21.02	.038	.040	.037	.038	.91	.52	.70	.69	N W	N W b N	N W b N	N 25 W	4.7	7.0	9.0	5.55	5.69	......	...
5	30.056	.931	.777	.9182	—5.5	6.8	4.8	2.12	—24.08	.024	.029	.052	.037	.70	.47	.95	.75	N N W	N W	N W	N 41 W	5.0	23.2	27.5	20.69	20.88	......	...
6	29.720	.608	.599	.6310	3.9	18.0	7.1	9.73	—16.77	.035	.050	.048	.043	.65	.49	.78	.62	N W	W	Calm.	N 56 W	19.5	2.4	0.0	5.85	6.11	......	...
7	.563	.473	—	—	4.3	24.4	—	—	—	.049	.110	—	—	.96	.84	—	—	W b N	W N W	W N W	N 71 W	7.2	9 4	3.0	4.21	4.41	......	...
8	.349	.260	.216	.2643	5.7	22.1	16.5	14.95	—12.28	.047	.075	.069	.062	.83	.83	.78	.73	Calm.	S S W	N W b W	N 53 W	0.0	3.0	11.2	4.28	5.04	......	Inap
9	.147	.123	237	1733	12.6	20.1	18.0	17.32	—10.20	.061	.063	.078	.067	.78	.58	79	.71	N W b W	N W b W	Calm.	N 61 W	11.0	14.0	0.0	7.09	7.69	......	Inap
10	.321	.355	.167	.2712	22.0	31.2	33.9	29.83	+ 2.02	.099	.105	.156	119	.84	.59	.80	.72	W S W	S W b S	S b E	S 22 W	4.4	14.5	7.8	5.65	6.83	0.015	...
11	.002	.336	.710	.3867	39.3	35.9	27.0	33.60	+ 5.37	.214	.105	.086	.137	.89	.49	.58	.68	S W b W	W b N	W N W	N 77 W	11.0	32.0	11.0	16.92	17.12	......	...
12	.807	.670	986	.8418	18.0	40.9	28.8	29.47	+ 0.92	.071	.078	.111	.090	.72	.29	.70	.57	Calm.	W S W	W b N	S 88 W	0.0	18.0	1.5	8.58	10.09	......	...
13	30.148	30.066	.888	30.0105	22.0	31.7	31.3	28.58	— 0.38	.089	.103	.152	.115	.75	.56	.86	.72	W N W	S E b S	E	S 72 E	1.2	6.0	3.5	3.34	3.96	0.012	...
14	29.640	29.643	—	—	32.8	45.8	—	—	—	.171	.239	—	—	.91	.77	—	—	Calm.	W S W	Calm.	S 66 W	0.0	6.0	0.0	0.58	1.25	0.305	...
15	.788	.736	.740	29.7502	37.5	37.5	36.4	37.00	+ 7.28	.221	.212	.209	.213	.98	.94	.97	.90	E N E	E b N	Calm.	N 80 E	5.6	1.0	0.0	1.72	1.72	0.120	...
16	.706	.544	.434	.5375	36.8	48.0	42.2	41.77	+11.73	.212	.310	.255	.253	.97	.92	.95	.95	Calm.	Calm.	Calm.	N 81 E	0.0	0.0	0.0	0.01	0.01	0.230	...
17	.348	.157	.061	.1820	40.0	54.1	46.5	46.70	+16.25	.241	.302	.279	.275	.97	.71	.88	.86	Calm	S S W	S S W	S 45 W	0.0	2.0	19.2	8.23	9.47	0.078	...
18	.200	.577	.762	.5490	45.4	47.6	38.6	43.12	+12.27	.221	.201	.151	.188	.72	.60	.64	.66	W b S	W	W b N	N 66 W	31.5	23.5	7.3	14.35	14.60	......	...
19	.929	.981	.984	.9790	33.5	39.4	32.1	34.88	+ 8.62	.172	.161	.150	.161	.89	.66	.82	.79	N W b W	S E b S	S E b S	S 85 E	4.5	7.0	3.8	2.84	5.33	......	...
20	900	.642	.243	.5532	31.0	36.8	—	36.42	+ 4.75	.147	.130	.217	.164	.85	.59	.92	.76	S E	E b N	E b N	N 84 E	6 0	14.1	1.8	6.62	7.55	0.125	...
21	28.921	28.998	—	—	45.8	37.8	38.8	—	—	.287	.190	—	—	.93	.84	—	—	W b N	W	W N W	N 87 W	3.5	34.0	23.5	22.69	23.62	0.010	Inap
22	29.538	29.638	.721	.6305	32.8	36.1	28.1	32.07	— 0.42	.130	.125	.098	.104	.70	.58	.63	.57	W b N	N W b W	N b W	N 43 W	14.5	19.6	6.5	10.77	12.14	......	Inap
23	.784	.725	.748	.7357	24.5	33.2	27.0	29.07	— 3.72	.102	.092	.115	.112	.77	.48	.77	.70	N b W	E	Calm.	S 74 E	4.0	6.9	0.0	3.06	3 67	......	...
24	782	.738	.655	.7200	35.9	38.4	38.7	38.78	+ 0.62	.093	.100	.126	.113	.66	.45	.65	.59	Calm.	Calm.	Calm.	S 8 W	0.0	0.0	0.0	1.14	1.87	0.020	...
25	.470	.364	.514	.4582	34.2	48.3	36.9	39.22	+ 5.65	.168	.099	.150	.142	.85	.28	.67	.62	N N E	W	N W	N 62 W	0.5	24.0	18.0	12.91	13.88	0.002	...
26	.074	.672	702	.0858	27.6	39.7	29.5	32.37	— 1.62	.122	.074	.092	.086	.81	.30	.55	.49	N W	N W	N W b N	N 35 W	7.5	16.0	11.7	10.84	10.97	......	...
27	.670	.535	.371	.5170	25.6	30.6	31.7	30.17	— 4.25	.103	.123	.125	.117	.74	.72	.69	.69	N W b N	E N E	N	N 33 E	2.2	6.4	8.5	3.78	4.61	......	Inap
28	.418	.484	—	—	33.2	45.1	—	—	—	.151	.119	—	—	.80	.39	—	—	N	N W b W	N W b W	N 49 W	4.8	7.2	7.4	8.47	8.91	......	...
29	.687	.701	.830	.7353	33.7	40.6	39.4	41.52	+ 6.42	.184	.115	.204	.162	.09	.32	.85	.63	N W b N	N W b N	N W b N	N 31 W	9.0	14.6	12.0	12.22	12.36	......	...
30	.855	.790	.812	.8150	36.8	48.7	38.9	46.60	+ 7.10	.113	.178	.092	.115	.51	.50	.39	.41	N b W	S b W	N b W	N 23 W	15.2	7.8	12.4	8.57	9.66	......	...
31	.828	.816	.762	.7975	34.2	48.7	42.2	43.27	+ 7.35	.118	.119	.125	130	.59	.84	.46	.40	N b E	S b S	N E	N 77 E	5.6	9.8	6.0	6.90	7.36	......	...
M	29.6515	29.6060	29.6218	29.6197	24.00	33.54	27.19	28.44	— 1.94	.117	.117	.123	.119	.79	.55	.75	.69	......	......	......	......	6.09	11.57	7.68	......	8.50	0.97	0.2

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR MARCH, 1858.

Highest Barometer . . . . 30.159 at 8 a.m. on 13th } Monthly range =
Lowest Barometer. . . . . 28.849 at 10 a.m. on 21st } 1.310 inches.

Self-register-ing Ther. { Maximum temperature . . . . 58°4 on p. m. of 17th } Monthly range =
Minimum temperature . . . . —5°5 on a. m. of 5th } 60°9
Mean maximum temperature . . 37°01 } Mean daily range = 15°08
Mean minimum temperature . . 21°93 }
Greatest daily range . . . . . . 25°4 from a. m. to p. m. of 12th.
Least daily range . . . . 2.2 from a. m. to p. m. of 15th.

Warmest day . . . 17th ... Mean Temperature . . . 46°70 } Difference = 44°58.
Coldest day . . . . 5th ... Mean Temperature . . . 2°12 }

Maximum { Solar . . . . 70°2 on p. m. of 17th } Monthly range =
Radiation { Terrestrial . . . . —16.5 on a. m. of 5th } 86°7

Aurora observed on 4 nights, viz.: 2nd, 12th, 17th and 18th; possible to see Aurora on 19 nights; impossible on 12 nights.

Snowing on 6 days; depth, 0.2 inches; duration of fall 11.0 hours.
Raining on 10 days; depth, 0.917 inches; duration of fall, 31.5 hours.

Mean of cloudiness = 0.50; most cloudy hour observed, 2 p. m., mean = 0.59: least cloudy hour observed, midnight; mean = 0.46.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
2779.23	650.28	664.17	4115.70

Resultant direction of the wind, N 58° W; Resultant Velocity, 5.45 miles per hour.

Mean velocity of the wind 8.56 miles per hour.
Maximum velocity . . . 35.4 miles per hour, from 3 to 4 p. m. on 21st.

Most windy day . . . . 21st—Mean velocity, 23.62 miles per hour.
Least windy day . . . . 16th—Mean velocity, 0.01 do

Most windy hour, 2 to 3 p.m.—Mean velocity, 11.78 do } Difference
Least windy hour, 3 to 4 a.m.—Mean velocity, 5.33 do } 6.45 miles.

5th—Very cold stormy day.
11th—Zodiacal Light very bright at 7 p. m.
12th—Beautiful display of Aurora; arches, patches, streamers and pulsations from 9 p. m. of 12th to 3 a. m. of 13th.
15th, 16th and 17th—Dense Fog.
20th—Solar Halo during the forenoon.
21st—Very Stormy day; severe squall of Rain, Sleet and Snow, 1 to 2, p. m.
22nd—Solar Parhelia and Halo at 4 p. m.; Lunar Halo from 7.30 p. m.
26th—Lunar Halo at 10 p. m. and midnight.
31st—Large and perfect Lunar Halo at midnight.

Temperature—The mean temperature of March was 1°31 below the average of 19 years.

Rain—The depth of rain was 1.497 inches less than the mean of 18 years.

Snow—The quantity of snow was 9.56 inches below the average of 16 years, and absolutely the least of the series.

Wind—The mean velocity of the wind was 0.66 miles per hour above the average of 11 years.

The Resultant Direction and Velocity of the Wind, from 1848 to 1858 inclusive, were respectively N 60° W, and 3.34 miles per hour.

COMPARATIVE TABLE FOR MARCH.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Difference from Average.	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant Direction.	Resultant Velocity.	Mean Velocity
1840	33.3°	+ 3.8°	56.9°	+ 3.7°	48.2°	8	1.640	8	...	...	...	...
1841	27.7	— 1.8	53.5	— 6.9	60.4	5	1.170	7	...	...	...	0.51lbs
1842	35.8	+ 6.3	68.7	+14.9	53.8	4	3.150	8	...	...	...	0.70 "
1843	21.3	— 8.2	38.6	— 2.8	41.4	2	0.625	18	25.7	...	...	1 18 "
1844	31.3	+ 1.8	50.3	+ 9.6	40.7	8	2.470	8	14.0	...	...	0.57 "
1845	35.4	+ 5.9	61.7	+ 9.9	51.8	5	...	8	2.8	...	...	0.66 "
1846	33.1	+ 3.6	49.3	+ 7.6	41.7	9	1.965	5	2.3	...	...	0.30 "
1847	26.2	— 3.3	44.3	+ 4.8	39.5	5	0.850	6	4.2	...	...	0.71 "
1848	28.6	— 0.9	58.9	+ 0.9	58.0	5	1.220	6	9.7	N 66 W	2.03	5.80ms.
1849	33.5	+ 4.0	53.4	+15.4	38.0	7	1.525	2	2.3	N 3 W	1.48	5.37 "
1850	29.8	+ 0.3	46.0	+ 6.0	40.0	2	0.745	7	11.2	N 52 W	2.62	7.62 "
1851	32.4	+ 2.9	58.7	+13.1	45.6	3	0.770	9	8.8	N 21 W	1.93	7.65 "
1852	27.7	— 1.8	44.8	— 3.2	48.0	8	3.080	12	19.5	N 8 W	0.71	5.81 "
1853	30.6	+ 1.1	56.3	— 0.1	56.4	6	1.080	8	7.1	N 62 W	2.56	5.87 "
1854	30.7	+ 1.2	52.8	+10.4	42.4	9	2.425	3	2.8	N 50 W	3.25	8.02 "
1855	28.5	— 1.0	48.6	— 2.9	51.5	5	1.485	11	18.1	N 88 W	4.76	9.95 "
1856	23.1	— 6.4	39.3	—13.6	52.9	0	0.0	12	16.2	N 71 W	7.68	11.39 "
1857	27.8	— 1.7	56.5	— 3.9	60.4	4	0.835	15	11.3	N 63 W	6.63	10.84 "
1858	22.4	— 1.1	54.1	— 5.5	59.6	10	0.917	6	0.2	N 58 W	5.45	8.56 "
Mean	29.75	...	52.25	+3.28	48.96	5.5	1.414	8.4	9.76	...	...	7.90

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—FEBRUARY, 1858.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL.D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32°			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind.	Rain in Inches.	Snow in Inches.	WEATHER, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.				6 A.M.	2 P.M.	10 P.M.
1	30.185	29.972	30.005	— 9.2	10.1	3.0	.017	.045	.044	.57	.60	.85	N E b E	N E b E	N E b E	0.71	1.78	9.96	...	...	...	Clear.	Clear.	Cirr. Str. 10.
2	29.504	.315	29.363	2.7	20.5	17.7	.038	.096	.086	.73	.85	.84	N E b E	N E b E	N b E	27.09	20 07	2.63	...	...	9.80	Snow.	Snow.	Do. 10.
3	.547	.538	.709	20.9	28.0	23.2	.075	.099	.100	.72	.64	.74	W S W	W S W	N W	13.08	19.60	12.61	...	...	...	C. Str. 4.	C. Str. 4.	Do. 10.
4	.863	.800	.898	6.4	23.0	15.0	.043	.088	.061	.75	.62	.73	W b S	W b S	N E b E	7.95	6.15	5.77	...	...	...	Clear.	Clear.	Do. 10.
5	.894	.835	.875	1.0	12.4	7.0	.030	.051	.048	.69	.69	.77	W b N	W b N	S S W	1.30	4.81	8.57	...	...	...	Do.	C. Str. 4.	Do. 10.
6	.996	.956	.969	— 1.8	18.2	7.2	.034	.075	.040	.84	.71	.79	W S W	W S W	S S E	0.20	7.46	1.40	...	...	...	Do.	Do. 4.	Clear.
7	.765	.627	.698	8.6	21.0	22.0	.042	.070	.101	.68	.80	.86	N E b E	N E b E	S W	5.43	4.37	1.81	...	...	0.75	C. Str. 10.	C. Str. 10.	Cirr. Str. 6.
8	.944	.971	30.050	9.0	15.0	— 0.3	.051	.055	.034	.77	.68	.81	N W	S b W	S b W	19.71	10.50	1.31	...	...	...	C. Str. 6.	Clear.	Clear.
9	30.031	.674	29.377	—14.1	4.2	9.1	.012	.038	.051	.50	.73	.77	N E b E	N E b E	N E b E	1.47	8.58	15.30	...	...	3.10	C. C. Str. 6.	Nimb. 10.	Nimb. 10.
10	29.201	29.344	.526	10.3	16.4	— 2.0	.054	.074	.030	.78	.83	.80	W b S	W b S	W	14.85	14.05	23.05	...	...	0.97	Cirr. Str. 4.	C. Str. 10.	C. Str. 4.
11	.787	.910	30.044	—15.7	1.0	—13.4	.010	.032	.012	.45	.70	.54	W	W	W	23.35	1.22	18.30	...	...	...	Clear.	C. C. Str. 4.	Clear.
12	30.120	30.124	.183	—26.3	9.8	—11.9	.002	.054	.063	.18	.78	.81	W	W	W S W	4.21	11.14	0.18	...	...	...	Cir. Str. 2.	Clear.	Do.
13	.330	.310	.236	—30.2	— 3.0	—15.5	.002	.025	.010	.2	.66	.46	W S W	W	W	0.08	0.11	0.33	...	...	...	Clear.	Do.	Do.
14	.010	29.952	29.876	—14.7	0.0	— 0.3	.011	.034	.034	.48	.70	.80	N E b E	N E b E	W b S	3.12	4.60	3.50	...	...	Inp.	C. C. Str. 8.	C. Str. 10.	Do.
15	29.973	.920	30.032	— 9.8	14.0	2.8	.019	.067	.036	.60	.81	.72	W S W	W S W	W S W	0.32	3.15	12.47	...	...	...	Cirr. 2.	Do. 4.	Do.
16	.886	.724	29.855	— 9.3	11.9	2.2	.018	.051	.028	.58	.70	.67	W S W	W b S	W b N	7.27	2.22	25.40	...	...	...	Clear.	Clear.	C. Str. 10.
17	.933	.976	.990	— 5.0	8.8	0.1	.022	.054	.036	.63	.78	.80	W b N	W b N	W b S	28.83	5.71	1.91	...	...	...	Cir. Str. 4.	Do.	Cl. Au. Bor.
18	.983	.948	30.079	— 5.4	5.0	— 4.0	.022	.057	.024	.63	.62	.65	W	W	W	20.03	11.47	10.87	...	...	Inp.	Do. 10.	Do.	Do.
19	30.227	30.137	.182	—20.2	10.6	— 9.4	.006	.054	.022	.33	.78	.78	W S W	S E	E N E	1.13	0.11	0.13	...	...	...	Clear.	Do.	Cirr. Str. 4.
20	29.958	29.748	29.701	—10.9	12.0	10.6	.021	.063	.050	.77	.81	.70	N E b E	E N E	W	4.90	7.97	1.10	...	...	...	C. C. Str. 8.	C. C. Str. 10.	Cirr. Str. 10.
21	.606	.596	.565	9.5	24.5	20.5	.051	.111	.085	.77	.61	.78	S b W	S W	W b N	8.08	7.22	8.56	...	...	0.06	C. Str. 10.	C. Str. 10.	Do. 8.
22	.910	.920	30.001	— 3.6	18.8	— 3.7	.025	.080	.125	.66	.79	.66	W b N	W S W	W b N	9.46	1.64	4.72	...	...	...	Clear.	Clear.	Clear.
23	30.114	30.179	.275	—16.9	16.4	8.5	.009	.065	.032	.43	.74	.60	S W b W	S S W	S W b S	0.02	0.40	8.17	...	...	...	Do.	Do.	Do.
24	.156	29.928	29.728	— 5.8	25.5	14.5	.022	.111	.061	.68	.81	.73	S S E	N E b E	N N E	1.68	2.25	1.22	...	...	...	C. C. Str. 8.	C. Str. 10.	C. Str. 10.
25	29.683	.540	.720	18.1	30.0	21.0	.068	.130	.091	.80	.78	.78	E b S	S	W b N	0.01	3.35	10.06	...	...	...	C. Str. 10.	C. C. Str. 8.	Do. 4.
26	.796	.781	.763	7.0	34.9	18.2	.046	.155	.051	.76	.79	.72	W b S	S S W	S	2.06	1.07	2.06	...	...	...	Clear.	Clear.	Clear.
27	.604	.470	.550	13.6	39.4	32.0	.063	.192	.169	.81	.82	.89	S b E	S b E	S b E	9.72	7.00	0.93	...	Inp.	...	C. Str. 8.	C. Str. 8.	C. Str. 4.
28	.600	.460	.410	32.0	34.0	32.5	.102	.155	.156	.89	.70	.85	S S E	E N E	W b N	0.73	3.57	5.90	...	Inp.	290	Do. 10.	Sleet	Snow.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—MARCH, 1858.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL. D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32° Fahr. 6 A.M.	2 P.M.	10 P.M.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	Tension of Vapor. 6 A.M.	2 P.M.	10 P.M.	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Velocity in miles per hour. 6 A.M.	2 P.M.	10 P.M.	Mean direction of Wind.	Rain in Inches.	Snow in Inches.	Weather, &c. A cloudy sky is represented by 10; A cloudless sky by 0. 6 A.M.	2 P.M.	10 P.M.
1	29.562	29.642	29.780	22.0	36.3	21.0	.112	.171	.101	.93	.82	.86	W N W	E S E	E	0.00	0.31	0.01	...	...	0.30	C. C. Str 4.	C. Str, 10.	Nimb 10.
2	.514	.425	.571	14.6	18.0	9.4	.054	.087	.057	.78	.84	.88	N N E	W	W S W	18.11	7.50	12.40	...	...	1.00	C. Str. 10.	Nimb. 10.	C. St. 10.
3	.816	.879	30.016	−9.0	15.4	−15.5	.019	.065	.016	.60	.74	.72	W S W	S W	E S E	7.17	3.31	1.48	...	...	...	Clear.	Clear.	Clear. Aur. Bor.
4	30.112	30.052	.125	−21.9	18.0	−3.2	.011	.067	.025	.63	.68	.66	S S E	S	N N E	0.01	0.30	0.48	...	...	...	Do.	Do.	Do.
5	.110	29.797	29.714	−15.8	11.8	8.1	.016	.051	.048	.70	.69	.71	W	W	W S W	2.30	10.53	15.55	...	...	Inp.	C. C. Str. 4.	Do.	C. St. 4.
6	29.762	.743	.700	3.0	9.0	0.2	.040	.051	.036	.74	.77	.84	W	W b N	W N W	14.03	4.10	9.43	...	...	1.00	Snow.	C. Str. 10.	Clear.
7	.626	.500	.371	−5.0	11.1	10.1	.022	.057	.054	.62	.76	.78	W N W	W N W	W N W	14.80	1.55	6.07	...	...	...	Clear.	Do. 10.	C. C. Str. 8.
8	.565	.464	.464	−1.1	26.9	2.9	.023	.117	.036	.61	.82	.72	N W	S W	E by S	7.10	0.70	0.06	...	...	...	Do.	Clear.	Do. 10.
9	.211	.134	.238	2.5	16.0	12.0	.034	.065	.060	.71	.74	.80	N N E	N N W	N N W	0.87	5.77	11.63	...	...	Inp.	C. Str. 10.	C. St. 8.	C. Str. 4.
10	.353	.424	.517	14.0	36.7	20.2	.051	.154	.076	.63	.88	.71	W b N	W	W	5.17	6.22	28.16	...	...	Inp.	Do. 8.	Do. 4.	Clear.
11	.257	.226	.539	15.7	31.0	20.6	.065	.155	.075	.74	.89	.70	S W	W	W b N	1.31	8.57	14.48	...	...	2.00	Do. 10.	Snow.	Snow.
12	.899	.850	.937	3.0	32.0	13.1	.036	.149	.048	.72	.84	.62	W S W	W S W	E	17.71	10.47	5.80	...	...	...	Clear.	C. St. 4.	St. 2. Aur. Bor.
13	30.361	30.270	30.223	2.0	19.0	14.1	.034	.071	.051	.71	.69	.63	E by N	S W	S W	6.01	1.51	3.92	...	...	...	Do.	Clear.	Clear. Do.
14	29.958	29.850	29.999	7.1	24.1	17.5	.045	.094	.072	.75	.75	.75	S E	N	W N W	1.60	5.41	0.02	...	...	0.90	Snow.	C. Str. 4.	St. 2 Do.
15	30.050	30.060	30.050	28.0	52.3	34.0	.135	.334	.175	.88	.86	.89	S W	S W	W	1.06	0.01	0.21	...	...	...	C. Str. 10.	Do. 10.	C. St. 10.
16	29.941	29.842	29.741	32.1	35.2	34.6	.162	.183	.175	.89	.90	.89	N E	S E	W b S	1.96	0.63	0.02	...	...	...	Do. 10.	Rain.	Rain.
17	.547	.471	.344	38.0	52.4	40.3	.208	.334	.212	.91	.86	.82	S W b W	W b S	S W	0.24	0.48	2.47	...	0.199	...	Do. 1.	C. Str. 4.	C. St. 8.
18	.246	.382	.682	38.0	43.0	36.7	.216	.254	.195	.91	.84	.82	S W	W S W	W b N	10.97	10.60	15.47	...	0.041	...	Do. 10.	Do. 10.	Rain.
19	30.001	30.150	30.199	26.0	44.4	26.1	.117	.186	.105	.76	.67	.75	N b W	S W	S S W	12.63	1.71	0.26	...	...	...	Clear.	Clear.	Clear.
20	.170	29.971	29.793	18.4	49.8	34.0	.075	.170	.153	.70	.71	.79	S S W	S W b W	W b S	0.01	0.01	0.28	...	...	...	Do.	Do.	Do.
21	.180	.021	.110	32.1	44.2	34.1	.143	.241	.175	.79	.84	.89	S b E	W S W	W S W	8.20	13.85	9.41	...	0.045	...	Rain.	Rain.	C. St. 8.
22	.489	.682	.782	25.5	24.4	20.4	.111	.083	.085	.81	.74	.78	W b N	W b N	N W	34.61	23.83	27.52	...	...	...	C. St. 4.	Clear.	Clear.
23	.882	.882	.918	11.1	34.8	25.0	.048	.149	.105	.69	.74	.80	N W	S S W	N b W	4.80	2.26	1.00	...	...	...	Clear.	Do.	C. C 4-Lun. Halo.
24	.963	.863	.984	11.4	40.6	24.6	.057	.188	.094	.79	.77	.73	S E	S S W	W b N	12.72	0.72	8.57	...	...	...	Do.	Do.	Clear.
25	.759	.584	.626	15.1	36.2	35.0	.065	.156	.162	.74	.75	.80	W b N	S S W	N W b W	1.46	1.70	7.11	...	...	...	C. C. St. 6.	C. C. St. 2.	Do.
26	.675	.584	.770	32.1	36.2	26.1	.162	.156	.105	.89	.75	.75	N W b W	S S W	W N W	11.97	13.77	1.20	...	...	...	C. Str. 10.	Clear.	C. St. 6.
27	.763	.661	.678	19.9	42.6	30.6	.075	.199	.148	.71	.74	.89	N b W	W b N	S S W	16.55	9.00	2.73	...	...	...	Do. 8.	C. C. St. 4.	Clear.
28	.632	.595	.694	18.9	48.9	36.2	.071	.245	.170	.70	.80	.80	W by S	S W b S	S W b W	0.50	0.17	0.11	...	...	...	Clear.	Clear.	Do.
29	.754	.737	.830	31.0	55.0	40.0	.130	.349	.203	.74	.81	.82	W S W	S W b W	N b W	0.56	0.22	7.30	...	...	...	Do.	Do.	Cir. Cum. 4.
30	.950	.937	.995	32.4	53.2	38.7	.137	.269	.201	.74	.67	.86	E N E	W S W	S S W	2.55	0.95	0.01	...	...	...	Do.	Do.	C. St. 8.
31	30.002	.964	.959	30.0	61.6	40.6	.136	.383	.197	.83	.71	.78	E N E	S b W	S b W	1.96	0.01	0.00	...	...	...	Do.	Do.	Clear. Aur. Bore

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR FEBRUARY.

Barometer	Highest the 1[illegible] day	[illegible]
	Lowest the 10th day	[illegible]
	Monthly Mean	[illegible]
	Monthly Range	1.[illegible]
Thermometer	Highest the 27th day	3[illegible]°.4
	Lowest the 13th day	—[illegible]
	Monthly Mean	[illegible]
	Monthly Range	[illegible]

Greatest Intensity of the Sun's Rays .... [illegible]

Lowest Point of Terrestrial Radiation .... —[illegible]

Mean of Humidity .... .7[illegible]

Rain fell on 1 day, Inp.; it was raining 15 minutes.

Snow fell on 8 days, amounting to 17.58 inches. It was snowing 53 hours and 45 min.

Most prevalent wind, W. by S. Least prevalent wind, E.

Most windy day, the 10th day; mean miles per hour, 17.81.

Least windy day, the 13th; mean miles per hour, 0.14.

Aurora Borealis visible on 1 night.

Moon eclipsed—visible.

Zodiacal Light very bright and well defined.

The Electrical state of the atmosphere has indicated high tension.

Ozone was in moderate quantity.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR MARCH.

Barometer	Highest, the 13th day	30.35[illegible]
	Lowest, the 21st	29.0[illegible]
	Monthly Mean	29.904
	Monthly Range	1.349
Thermometer	Highest, the 31st day	61°.6
	Lowest, the 4th day	—21°.9
	Monthly Mean	23°.3[illegible]
	Monthly Range	83°.5

Greatest intensity of the Sun's Rays .... 89°.9

Lowest point of Terrestrial Radiation .... —23.1

Mean of Humidity .... .789

Rain fell on 3 days amounting to 0.285 inches; it was raining 19 hours 0 minutes.

Snow fell on 8 days, amounting to 4.20 inches; it was snowing 20 hours 45 minutes.

The most prevalent wind was W. by N.

The least prevalent wind N.

The most windy day the 22nd; mean miles per hour 28.65.

Least windy day the 28th; mean miles per hour 0.26.

The most windy hour was from 8 to 9 on the 22nd; 37.70 miles.

Aurora Borealis visible on 4 nights.

Lunar Halo on 1 night.

The electrical state of the Atmosphere has indicated feeble intensity.

Ozone was in moderate quantity.

The Song Sparrow (*Fringilla Melodia*) first heard on the 20th.

The Snow Bird (*Plectrophanes Nivalis*) was very seldom seen during the winter.

CONTENTS.

***** The Annual Subscription, due in January, Country Members, $3; in Toronto, $4.**

The next Number of this Journal will be issued in July.

THE
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*** *Communications for the Journal to be addressed to the General Editor,* DR. WILSON, *University College, Toronto.*

NORTHERN GROUP

THE CANADIAN JOURNAL.

NEW SERIES.

No. XVI.—JULY, 1858.

THE OBSERVATORY AT ST. MARTIN, ISLE JESUS, CANADA EAST.

FROM NOTES BY PROFESSOR CHARLES SMALLWOOD, M. D., LL. D.

Read before the Canadian Institute, 20th February, 1858.*

The following sketch of the general appearance of the building and instruments, from the pen of Dr. Hall, of Montreal, furnishes a very suitable introduction to Dr. Smallwood's account of the Observatory established by him at St. Martin, Isle Jesus.

A small wooden building, distant about twenty yards from the dwelling house of Dr. Smallwood, contains the whole of the apparatus which has for many years furnished such valuable results. A short distance from it, and on a level with the ground, is the snow gauge. Immediately in front of the entrance to the small building is a dial, with an index to point out the course of the clouds. Contiguous to the building again may be seen four erect staffs. The highest of which—80 feet—is intended for the elevation of a lighted lantern, to collect the electricity of the atmosphere, the copper wires from which lead through openings in the roof of the building to a table inside, on which a four-armed insulated conductor is placed. The lantern is made to ascend and descend on a species of railway, in order to obviate all jarring. On another pole is placed the wind vane, which, by

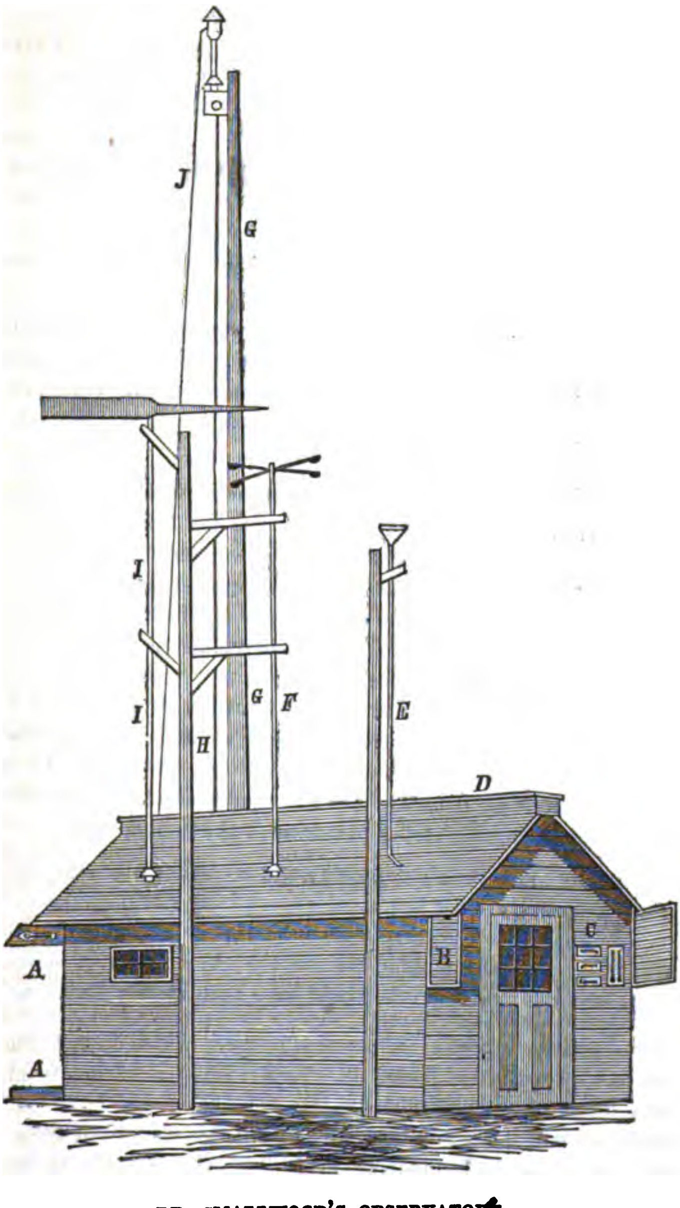
* For the wood-cuts which illustrate this paper, the Council of the Canadian Institute are indebted to the liberality of Professor Henry, LL. D. of Washington, U. S.

a series of wheels moved by a spindle, rotates a dial inside the building marked with the usual points of the compass. Another staff, about 30 feet high, contains the anemometer, or measurer of the force of the wind, which, by a like arrangement of apparatus, is made to register its changes inside. The last pole, 20 feet in height, contains the rain guage, the contents of which are conducted by tubing also into the interior of the building, in which, by a very ingenious contrivance, the commencement and ending of a fall of rain are self-marked.

At the door entrance on the right side is a screened place, exposed to the north, on which the thermometer and wet bulb thermometer are placed, four feet from the surface of the earth. A similar apartment on the left contains the scales with which experiments are conducted throughout the winter to ascertain the proportional evaporation of ice.

On entering the door, in the centre of the apartment is a transit instrument *in situ*, for the convenience of using which openings are made in the roof, usually kept closed by traps. This apparatus is not the most perfect of its kind, but is amply adequate for all its uses. On the left is a clock, the works of which, by means of a wheel, are made (while itself keeps proper time,) to move slips of paper along little railways, on which the anemometer by dots registers the velocity of the wind; the rain guage, the commencement and end of showers; and the wind vane, the continually shifting currents of wind. This is effected by a pencil, kept applied by a spring to a piece of paper on the dial previously alluded to, and as, by the clock-work, the dial and the two previously mentioned slips of paper move at the rate of one inch per hour, so it is easy to determine, in the most accurate manner, the direction and force of the wind at any hour of the day, or any period of the hour. With the exception of the clock, the whole of this miniature railway work, with all its apparatus, wheels, &c., &c., is the work of Dr. Smallwood's own hands, and exhibits, on his part, a mechanical talent of the highest order.

At the extreme end of the room is a table, beneath which is an arrangement for a heating apparatus, and on which is the four arm conductor previously alluded to. To the two lateral and front arms hang, respectively, two of Volta's electrometers, and one of Bennet's, while beneath the knob on the anterior, there is a discharging apparatus, with an index playing over a graduated scale, to measure during thunder storms the force of the electric fluid, by the *length* of



DR. SMALLWOOD'S OBSERVATORY.

its spark. On this subject we cannot avoid a reflection on the fate of the unfortunate Richman. In this case such precautions are adopted as will obviate any casualties whatever; great precaution, however, is required in these experiments, and Dr. Smallwood, fully aware of it, has the whole placed in connection with the earth by means of a brass chain and iron rod. As another proof of Dr. Smallwood's ingenuity and mechanical skill, we may notice that the whole of this apparatus, even to the electrometers, is the result of his own handicraft; and the whole arrangements in the little room are a signal proof how much a man may do unaided, and how well he can effect an object if thrown entirely upon his own resources.

On the right wall of the apartment are suspended the barometers, of which there are three. 1. A standard of Newman's; 2. Another of Negretti's, but of different construction; and 3. One of Dr. Smallwood's own construction. The means of the three observations is the measure adopted for the observation.

The only other instrument deserving of notice is the one to determine the terrestrial radiation; and this also has been made by Dr. Smallwood. It consists of a mirror of speculum metal, (composed of copper, zinc, and tin,) of six inches in diameter, and wrought into the form of a parabolic surface, in the focus of which, at the distance of eight feet, a self-registering spirit thermometer is placed. The construction of this was a labor requiring great nicety in execution, and involving the sacrifice of much time; but perseverance even here conquered the difficulties, and we witnessed a mirror whose reflecting powers would not have disgraced Lord Ross' telescope. In fact, placed in a telescope, it has, we are informed, proved itself capable of resolving those singular stellar curiosities—the double stars.

Dr. Smallwood certainly deserves great credit for his perseverance in a favorite study, under the most unpromising circumstances; but in nothing is he so remarkable as in that peculiar ingenuity which has led him to overcome difficulties in the prosecution of scientific enquiry, which, to most minds, would have been utterly discouraging.

The Natural History Society of Montreal have petitioned the legislature for a grant of money to enable them to publish Dr. Smallwood's tables of observations for the last twelve years. This is a measure, on which no difference of opinion can be anticipated, and must meet with the support of every man who has the welfare of science and Canada at heart.

DESCRIPTION OF THE OBSERVATORY BY DR. SMALLWOOD.

The observatory is placed in the magnetic meridian, is constructed of wood, and has an opening in the roof, furnished with sliding shutters for taking observations by means of the Transit Instrument, of the passage of a Star across the meridian for the purpose of obtaining correct time.

It is also connected by the Montreal telegraph with the principal places in the United States; the wires being laid into the Observatory. It has also a seven-inch achromatic telescope, 11 feet focus. The object glass, by Frauenhofer of Munich, is mounted equatorially and possesses right ascension and declination circles; and observations are taken on the heavenly bodies as often as there are favourable nights.

Observations for the purpose of Meteorology, are taken by the usual instruments, at 6 and 7 a.m. 2, 9 and 10 p.m. daily, besides, extra hours, on any unusual occurrence. Constant tri-daily observations are also taken on the amount and kind of atmospheric electricity, also on the amount of Ozone, and likewise particular attention is directed to the phenomena of thunder storms—all of which observations are regularly recorded. Besides these daily observations, record is kept of the temperature of springs and rivers and the opening and the closing thereof, by ice; also on the foliation and flowering of plants and trees, and the periodic appearance of animals, birds, fishes and insects, besides the usual observations on auroras, haloes, meteors, zodiacal light, and any remarkable atmospheric disturbances.

Many of the instruments, are self-registering and to some the photographic process may be applied, being constructed for that purpose.

The Observatory is furnished with four barometers. 1. A Newman standard, 0.60 of an inch bore; the brass scale extends from the cistern to the top of the tube, and is adapted for registration by the photographic process. 2. A Negretti and Zambra's tube, 0.30 of an inch bore; another of a small bore, and also an Aneroid. The cisterns are all placed at the same height (118 feet,) above the level of the sea and are read at each observation.

Thermometers of Sixes, Rutherford, Negretti, &c., the readings of which are corrected, with the standard instruments of the new observatory, and most of the scales are engraved on the stem of the tubes. Care is taken to verify them twice a year, they are placed four

feet from the ground, and have occupied the same position for some years, being placed free from radiation, and carefully shaded from the sun and rain.

The *Psychrometer*, consists of the dry and wet bulb thermometers, the scales of which are coincident, and have been carefully read together. There is also a Saussures' hygrometer. In winter the wet muslin is supplanted by a thin covering of ice which requires frequent renewal.

For *solar radiation* a maximum Rutherford's thermometer is used, with the bulb kept blackened with Indian ink; the tube is shaded by a piece of glass blackened also with Indian ink, which prevents the index from adhering to either the tube or the mercury, as is often the case when not shaded.

Terrestrial radiation is indicated by a spirit thermometer of Rutherford, which is placed in the focus of a parabolic mirror, 6 inches in diameter and of 100 inches focus.

Drosometer or dew measurer.—One is of copper, like a funnel, the inside of which has been exposed to the flame of a lamp and has been coated with lamp black; the other is a shallow tin dish painted black and ten inches in diameter.

Rain-gage.—The reservoir is thirteen inches in diameter, and is placed 20 feet above the soil. It is self-registering, and is attached to the anemometer and shews the beginning and ending of the rain and the amount of precipitation in inches on the surface.

The *Snow-gage* presents 200 square inches of surface, and is placed in an open space. The surface of the snow requires to be lightly levelled, before taking the depth, which is recorded in inches. A tin tube, 3 inches in diameter aud 10 inches long, is used for obtaining snow for the purpose of reducing the amount to the relative amount of water. The tin tube fits in another vessel of tin of the same diameter, aud the snow is easily reduced and measured.

The Evaporator exposes a surface of 100 inches; and is carefully shaded from sun and rain. It is made of zinc and a glass scale, graduated in inches and 10ths, is well secured in front of it, a strip of the metal being removed the glass scale supplies its place, so that the amount evaporated can be easily read off. Its place is supplied in winter by a pair of scales, upon one of which is placed a disc of ice, and the amount of evaporation from the surface is estimated by being very accurately weighed.

The *Ozonometers* are Schonbien's and Moffat's. The solution

consists of one drachm of starch, boiled in one ounce of distilled water, to which is added when cold 10 grains of the Iodide of Potassium—this is spread on *sized* paper which is found to answer better than bibulous or *unsized* paper, for the solution is more equally distributed over the surface, whereas on bibulous paper it is very difficult to spread the solution equally. It is cut into slips of about 3 inches long and 5 inches wide—having been previously dried in the dark it is also requisite, to keep it dry and free from light. When required one of these slips is placed 5 feet from the ground and shaded from the sun and rain,—another of these slips of ozone paper is elevated and exposed at an altitude of 80 feet, for the purpose of comparison. It is also well to place slips of this prepared paper in the vicinity of any vegetables, which may be affected with disease, for instance during the prevalence of the potatoe rot.

A *Microscope* and apparatus for the examination of snow crystals and also obtaining copies by the chromotype process, is also provided.

The Electrical Apparatus.—This consists of three parts: a hoisting, a collecting and a receiving apparatus.

The hoisting apparatus consists of a pole or mast 80 feet high. It is in two pieces, but is spliced and bound with hoop iron, and squared or dressed on one face for about six inches. It is dressed in a straight line to receive cross pieces of two-inch plank, 8 inches wide and 12 inches long, which are firmly nailed to the mast or pole about three feet apart; this serves as a ladder to climb the pole in case of necessity. Each of these cross pieces is *rebated* to receive pieces of inch board 4 inches wide, and placed edgeways in the *rebate*, extending from the top to the bottom of the pole, and forms a sort of vertical railway; these pieces are also grooved or rebated to receive a slide, which runs in these grooves and carries the receiving apparatus. From the top of the sliding piece passes a rope over a pulley fixed at the top of the mast, and from it to a roller and windlass, by which means the collecting lantern is raised or lowered for trimming the lamps. It has also been used for the purpose of placing the ozonometer at that height (80 feet.) The lower part of the mast or pole is fixed into a cross piece of heavy timber, and is supported by four stays. These cross timbers are loaded with stones, and are thus rendered sufficiently firm.

The collecting apparatus consists of a copper lantern 3 inches in diameter, 5 inches high. (See top of mast G, fig 1.) The bottom is moveable and the lamp is placed in it by the means of a small copper

pin passing in a slit, which is a very easy method of fixing it. This lantern is placed on top of a copper rod of ½ inch thick and 4 feet long: the bottom of the lantern having a piece of copper tube fixed to it, a very little larger than the rod, and is thus easily removed and replaced. To the lower end of the copper rod is soldered an inverted copper funnel, a *parapluie*, for protecting the glass insulating pillar upon which it is fixed by means of a short tube firmly soldered to the underside of the *parapluie*. This glass pillar passes into and is fixed firmly in a wooden box, and is freely exposed to the heat of a second lamp, which is placed in this box. It is trimmed at the same time as that in the collecting lantern, and keeps warm and dry the glass pillar, by that means securing a more perfect insulation. From this upright rod and collecting apparatus descends a thick copper wire which serves to convey the accumulated electricity to the receiver which is placed in the observatory.

The receiver consists of a cross of brass tubes (gas tubes), each about 2 feet long, and is screwed into a large tube fitting upon a glass cone, which is hollow, forming a system of hollow pipes for the passage of the heat internally, and keeping up a certain amount of dryness and consequent insulation. The glass cone is fixed upon a table over an opening made in it, fitting to the hollow part of the cone. Immediately under this table is placed a small stove of sheet-iron, about 8 inches in diameter, made double, the space of about 1 inch being left between the two chambers; and this plan has been found to effect a good insulation by keeping the whole of the apparatus warm and dry. Charcoal is used as fuel, and is, I think, preferable to a lamp. A coating of suet or tallow is applied to the glass cones or pillars. Care must be taken not to rub or polish the collecting apparatus as it seems to deteriorate its power of collecting and retaining atmospheric electricity; and I have found that its collecting powers increase with its age. Suspended from these cross arms hang the *electrometers*. 1. *Bennet's electroscope* of gold leaves; this scarcely needs a description. 2. *Volta's electrometer*, *No.* 1, consisting of two straws, two French inches long: a very fine copper wire passes through these straws, which are suspended from the cross-arms. This electrometer is furnished with an ivory scale, the old French inch being divided into twenty-four parts, each being 1°; this forms the standard scale for the amount of tension. 2. *Volta's electrometer, No.* 2, is similar to the No. 1, but the straws are five times the weight of No. 1, so that one degree of Volta's No. 2 is equal to

five of No. 1. *Henly's electrometer* is a straw suspended and furnished with a small pith ball: each of the degrees of Henly's is equal to 100° of No. 1 of Volta's. These electrometers are all suspended from the cross-arms. *A discharging apparatus*, furnished with a long glass handle, measures the length of the spark, and serves also as a conductor to carry the electricity collected to the earth, and is also connected by a chain and iron rod passing outside of the observatory for about twenty yards, and buried under ground.

Various forms of *Distinguishers* are used to distinguish the kinds of electricity. The Volta's electrometers may be rendered self-registering, with great facility, by the photographic process. By placing a piece of the photographic paper behind the straws, and throwing the light of a good lens upon them, the expansion is easily depicted, and serves well for a night register. There is also a Peltier's electrometer, and another form of electrometer, consisting of two gold leaves suspended to a rod of copper two feet long; the upper end being furnished with a wire box, in which is kept burning some rotten wood (touch-wood.)

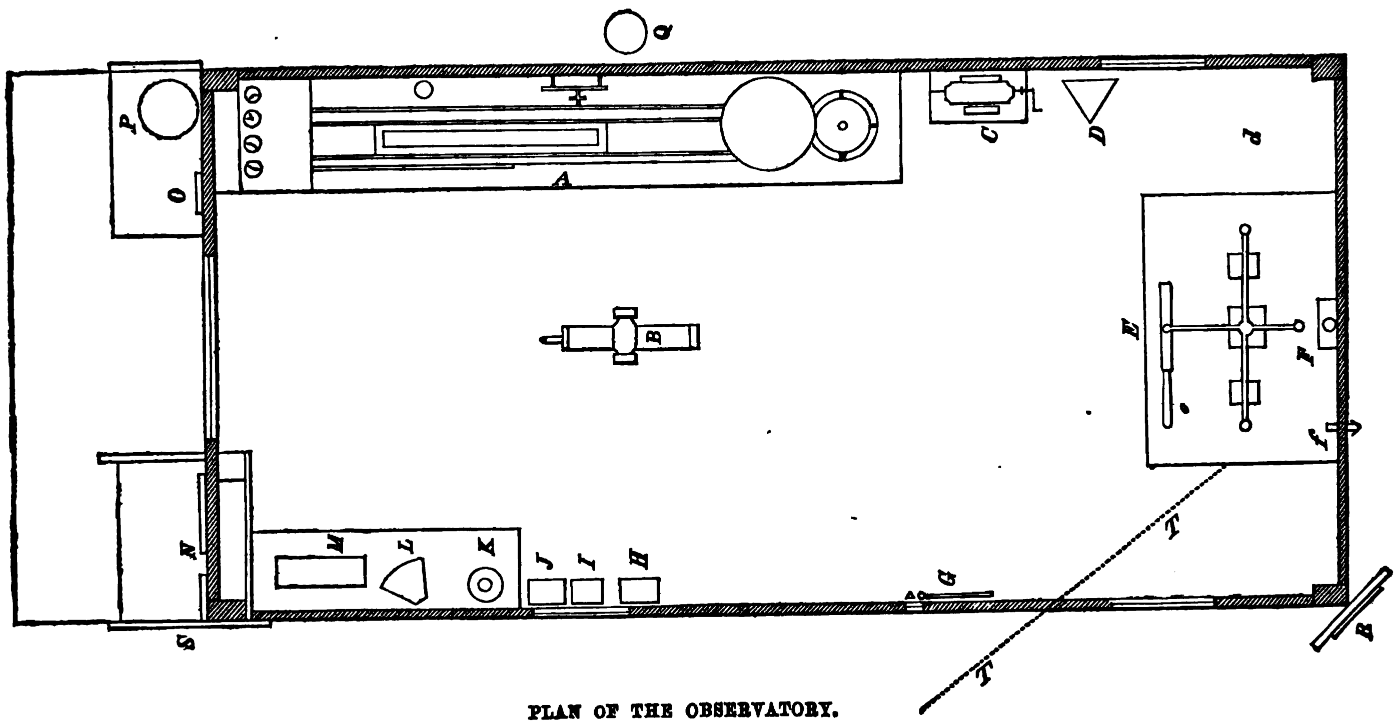
The *Anemometer* consists of a *direction shaft* and a *velocity shaft*: to the top of the direction shaft is placed the vane, which is eighteen feet in length. The shaft is made of three pieces, to insure lightness and more easy motion: each piece is connected by means of small iron-toothed wheels. The two shafts are six feet apart, and work on cross-arms from a mast firmly fixed in the ground. The vane passes some six or eight feet above the velocity shaft, and does not in any way interfere with the other movements. The lower extremity of these shafts are all furnished with steel points, which work on an iron plate or a piece of flint, and pass through the roof of the Observatory; the openings being protected by tin parapluies fixed to the shaft, and revolving with them. Near the lower extremity is placed a toothed-wheel, eight inches in diameter, connected to another wheel of the same diameter, which carries upon its axis a wooden disc, thirteen inches in diameter, upon which is clamped a paper register (old newspapers answer very well) washed over with whiting and flour paste. Upon the surface of this register is traced by a pencil the direction of the wind. This register is renewed every twelve hours.

The *velocity* shaft is in two pieces, connected by means of the toothed wheels and steel pivots, as in the direction shaft; and, practically, the friction is *nil*. At the top of the velocity shaft are fixed

three hemispherical tin or copper caps, ten inches in diameter, similar in construction to those of the Rev. Dr. Robinson of Armagh, and are firmly rivetted to three iron arms of $\frac{5}{8}$-inch iron. These caps revolve always in the same direction, and one revolution is found to be just one-third of the linear velocity of the wind. I have no reason to doubt Dr. Robinson's formula for this calculation. At the lower extremity of the velocity shaft is fixed a one-toothed wheel, $2\frac{1}{4}$ inches in diameter; this moves a second, or ten-toothed, wheel, which also gives movement to a third wheel. This marks a hundred revolutions of the caps, which are so calculated that each one hundred revolutions are equal to one mile linear; and whenever one hundred revolutions have been accomplished, a small lever is elevated by means of an inclined plane, fixed upon the edge of the last wheel, and which gives motion to the lever. The other extremity of the lever is furnished with a fine steel point, which dots off, upon a paper register, the miles as they pass. This register is of paper, one and a quarter inch wide, and is removed every twelve hours.

Between the two shafts, at the lower extremities, are placed two runners of wood, *rebated*, to receive a slide or train, which carries the register. To the underside of this slide is fixed a rack, and it is moved by a pinion, the movement of which is communicated by a clock,—the cord of the weight being passed over a wheel and pulley,—and advances one inch per hour, and the lever before described dots off the miles as the register advances under the steel point. In this manner it shows the increase and decrease of the velocity, and also the moment of its change. Attached to this moveable train is a rod of wood carrying a pencil, which passes over the disc connected with the direction shaft, and there traces, as it advances, the direction of the wind, the moment of its changes, and the point from which it veered. The extreme height of the vane is forty feet, but this might be increased if required. The clock is wound up every twelve hours, which brings back the train to its starting point.

There are also a polariscope, prisms, and glasses of different colors, for experimenting on the different rays of light, in connexion with the germination of seeds, and the art of photography. The Observatory possesses a quadrant and artificial horizon, which serves for measuring the diameter of halves, and altitudes of auroral arches, &c.: also a dial for the indication of the direction and course of the clouds; and other minor instruments.



PLAN OF THE OBSERVATORY.

EXPLANATION OF EXTERNAL VIEW OF THE OBSERVATORY.

A. Thermometer for solar radiation.

B. Screen of Venetian blinds.

C. Thermometer.

D. Opening in ridge of the roof, closed with shutters, to allow use of transit instrument.

E. Rain guage with conducting pipe through the roof.

F. Velocity shaft of the anemometer.

G. Mast for elevating apparatus for collecting electricity.

H. Cord for hoisting the collecting apparatus.

I. Copper wire for conducting the electricity into the building.

J. Direction shaft of the anemometer.

EXPLANATION OF THE PLAN OF THE OBSERVATORY.

A. Anemometer.

B. Small transit for correcting time.

C. Electrical machine for charging the Distinguisher.

D. Peltier's electrometer.

d. Space occupied by Drosometer, Polariscope, &c.

E. Electrometer. e. Discharger.

F. Distinguisher.

f. Small stove—sometimes used in damp weather.

G. Thermometer placed in the prismatic spectrum for investigations on light.

H. Nigretti & Zambra's barometers and cisterns, 118 feet above the level of the sea.

I. Small-tube barometer.

J. Newman's barometer.

K. Aneroid barometer.

L. Quadrant and artificial horizon.

M. Microscope and apparatus for ascertaining the forms of snow crystals.

N. Thermometer, psychometer, &c., 4 feet high. A space is left between the two walls to insure insulation and prevent radiation.

O. Ozonometer.

P. Evaporater—removed in winter and replaced by scales for showing the amount of evaporation from the surface of ice.

Q. Post sunk in the ground, and 40 feet high, to carry the arms of support for the Anemometer.

R. Solar radiator.

S. Venetian blinds.

T. Iron rod beneath the surface of the ground connected with the discharger to insure safety.

SOLAR SPOTS OBSERVED AT TORONTO, IN JANUARY, FEBRUARY AND MARCH, 1858.

BY COLONEL BARON DE ROTTENBURG, C. B., F. R. A. S.

Read before the Canadian Institute, 13th March, 1858.

The following remarks may not possess any novelty—the forms of the Solar Spots recorded in this paper and its accompanying drawings having, in all probability, been often seen by others. But the subject is one of the greatest interest, and the observations of amateur astronomers, on the Solar Spots, may possibly be of essential service to those laborious men who make the nature and constitution of the Solar Atmosphere the business of their lives. Thus, for example, observations made here on any particular day, may supply a link in a series of observations which the systematic observer was unable, from unfavourable atmospheric conditions, to ascertain; and tend possibly to elucidate some general law or conclusion. At any rate, I believe this is the first attempt made to record the daily changes in the Spots on the Sun, by any member of the Institute, for the purpose of communicating them at its meetings, and I offer the following abstract of the phenomena, taken from my Register of Observations, with the accompanying drawings,—which furnish very feeble and inadequate representations of the original,—in the hope that others will be induced to join me in this attempt to give a more prominent place in the records of the Journal of the Institute to familiar natural phenomena.

Extract from Register.

January 21st, 12 hours 15 minutes, apparent time. A large spot seen near the Sun's north-eastern limb, with a well defined Nucleus and Penumbra—two small spots on each side of the Penumbra, the small spot towards the Sun's centre being darker than the one towards the limb—the smallest part of the Nucleus being towards the limb. The definition excellent—air calm—prominent faculæ seen between the spot and the north-eastern limb.

January 22nd. Spot observed again about the same hour as yesterday. Nucleus had materially changed its form—having become much more elongated—shewing a probability of its breaking up into several spots—definition indifferent—Sun's limb tremulous—strong wind blowing from east—the two small spots could not be seen, nor

were the Faculæ so well seen as yesterday—the Penumbra fainter to-day, probably on account of haze in the atmosphere.

January 22nd, 12°-20′, apparent time. Definition good, with a slight haze—Penumbra darker to-day—the Nucleus has broken up into four portions, with some smaller spots towards the limb and centre of the Sun—the general shade of the Southern part of the Penumbra darker than the Northern part—a faint Penumbra round small dark spot near the limb—very strongly defined Faculæ seen close to the opposite or north-western limb—observed granular appearance of the body of the Sun.

January 24th, 12°-15′, apparent time. Main body of Nucleus has nearly separated from the other parts, and formed a distinct spot surrounded by a Penumbra—there being three small Nuclei separating the larger spot from the other two—one of the spots seen on the 22nd having either disappeared or merged into the others—the Penumbra smaller at the part between the principal spot and the others, shewing a tendency to isolate the principal spot—Faculæ on opposite limb very brilliant and strongly defined—definition very good—Sun's disc granular—Penumbra generally darker than previously observed—no other spots visible on this or on previous days, besides those referred to.

January 25th. Cloudy, and no observation.

January 26th, 1°-30′ apparent time. The separation between the principal spot and the others complete—the Nucleus of the principal spot extending to the edge of the Penumbra, on the side towards the Sun's north-eastern limb—one portion of the Penumbra round the spots nearest the limb, very much more brilliant than the other parts—Penumbra much striated round Eastern spots—a small spot to the South of the ones nearest the limb, with cloudy looking streaks between it and the Penumbra, not exactly Penumbra, but more resembling cirrhous clouds—about ten or eleven new spots observed on the south-eastern limb, not far removed from the Equatorial regions of the Sun, a faint Penumbra apparently round one of them—strongly marked Faculæ around these new spots. The spots originally observed are approaching the western limb, having, I consider, passed the centre of the Sun about the 24th instant.

I may here observe that the Telescope used was an Equatorial Refractor of excellent quality, made by Henry Fitz of New York, of sixty-two and a half inches focal length, and a clear aperture of four and half inches, very firmly mounted, surrounded by a circular wooden building, with a revolving dome; the eye-piece used was a positive or

Rumsden's eye-piece, magnifying about ninety times; the shaded screen used from the 21st to 24th inclusive, was a compound one, composed of one dark purple glass, and one green glass, giving a greenish yellow image, the yellow predominating. On the 26th the screen used was made of three green glasses, giving a greenish image; the full aperture of the Telescope was used on every occasion, and with these appliances the observations were made with perfect safety and comfort. The shaded screens were supplied to me by Mr. Potter, Optician, of this city.

I regret that, in consequence of my not having a Micrometer attached to my Telescope when these observations were first made, I have been unable to give correct measurements of the dimensions of the spots, and of their distances from the limb of the Sun. I resume the extracts from my register.

The 27th, 28th and 29th were cloudy days, and no observations could be made.

On the 30th. This day, at 12°–20′, apparent time, definition bad—Sun's limb very tremulous—strong wind blowing, and atmosphere very much disturbed. The spots first seen on north-eastern limb are now close to the North-Western limb, parallel to it. Penumbra seen above and below Nucleus of each spot, and also on the side next to the limb—no Penumbra on side next the Sun's centre—these spots are much diminished in size—the small spots advanced towards the Sun's centre—four Nuclei enclosed in a common Penumbra, which is very faint—observed a very large spot close to South-Eastern limb, with a well defined Nucleus—the Penumbra broad towards the limb, and just visible only towards the Sun's centre—the upper and lower parts of the Penumbra of this spot much darker than the central parts—the spot parallel to the Sun's limb. This spot is marked No. 7, in the accompanying drawing.

South-Eastern Group.

February 1st. Definition only tolerably good—fringed look of Nucleus, which is lighter towards the Sun's centre; whilst the Penumbra is darker towards the limb of the Sun—the Nucleus separated by a light kind of band—brilliant Faculæ around the lower spots.

Februarg 3rd. Definition good—ragged look of Nucleus—light colored arch in it — Nucleus not equally dark—some parts much lighter than others—small spots much increased in size and number.

February 4th. Light clouds at intervals—definition good—the same ragged or streaky look of the Nucleus observed.

February 5th. Spots are now near the centre of the Sun—remarked two bright spots, with dark circles towards the Nucleus, in the Southern Penumbra—Penumbra generally had a jagged look.

February 6th. Definition indifferent—light scud passing over Sun, the Penumbræ of small spots forming angles towards the centre of the Sun—the Penumbra surrounding the small spots lighter than the Penumbra of the principal one.

February 10th. Definition very indifferent—heavy wind and scud flying over Sun—prominent Faculæ near north-eastern limb, as if a spot was about to appear—large spot much diminished in size—only a little larger than the lower one.

February 12th. Definition indifferent—new spot appeared in north-eastern limb, in position indicated by the brilliant Faculæ on the 10th instant—most brilliant Faculæ all round the spots in the western limb, their extent marked by dotted line in the accompanying drawing.

February 13th. Spots still on the sun, but the definition so vile that no drawings of them could be made—from edge to edge of Penumbra=75 seconds. Observed same spots again on 13th and 17th of March (see drawing appended), extent of edges of Penumbræ of both spots, A A,=113 seconds, or 52,658 miles on the 17th March. The appearance of portions of the Penumbra between the Nucleus of the spots gave some impression of a vortex, the Penumbra being stretched, and the streaks parallel to its edges generally—observed some small spots near Sun's centre, and spots also going off and coming, in the western and eastern limbs.

March 12th. Observed two large spots on south-eastern limb; these spots to my vision had all the appearance of cavities when I first saw them near the Sun's limb on the 8th instant. On the 12th I measured the diameter of the two principal spots with a parallel wire Micrometer, from the exterior edges of the Penumbra which enclosed both Nuclei of the two spots—the diameter was 75 seconds. I measured the same again on the 13th, when the spots were near the Sun's centre; the extent from edge to edge of the Penumbra was 2 minutes. Since communicating the results of these observations to the Canadian Institute, I have continued to note the changes which occurred, and especially observed those affecting the dimensions of the spots measured on the 12th and 13th. On the 17th I again measured the distance from edge to edge; it then was 113 seconds, which is equivalent to 52,658 miles. The appearance of the spots on the 17th March is given in the accompanying diagram. There were sev-

eral other spots observed near the eastern and western limbs of the Sun, and the general characteristic of the Solar Atmosphere, during the month of March, has been one of great disturbance. On one occasion I counted no less than fifty spots, with well defined Penumbræ.

The Eclipse of the Sun, on the morning of the 15th March, could not be observed at Toronto, on account of a dense fog which prevailed at the time of the Eclipse. The occultation of these large spots by the Moon's body, it was conceived, might probably offer some valuable facts with regard to their nature, and also the constitution of the Solar Atmosphere, at those localities where the Eclipse could be favorably observed. The condition of the atmosphere, which precluded all possibility of observing the occulation, was therefore a source of considerable disappointment to me.

SOCIAL AND WARLIKE CUSTOMS OF THE ODAHWAH INDIANS.

BY F. ASSIKINACK, A WARRIOR OF THE ODAHWAHS.

Read before the Canadian Institute, January 23rd, 1858.

I purpose in this paper to give a brief statement with reference to the habits, social and warlike customs of the Odahwah Indians, which may likewise apply in some respects to other tribes that did not differ widely from them in language and manners. In doing so I shall commence with the young.

Some time after the birth of a child, the parents, or rather grandparents, prepared a feast, to which the principal men of the tribe were invited. At the commencement of the banquet one of the old warriors was requested to name the child, upon which he left his seat and began to sing as he danced slowly round the fire-place in front of the guests, and when he arrived at the door he called out the name he intended to give the child. On hearing the name the guests gave a hearty cheer in token of their approbation. During the performance of the dance round the hearth some of the party busied

themselves in giving the appropriate responses, while others uttered encouraging words with becoming gravity.

With regard to the manner of bringing up Indian children nothing can be more erroneous than to suppose that the young were allowed to grow up without any sort of discipline. So far from this having been the case, in addition to the ordinary way of correcting children, there were many other restraints imposed upon the young. The Indians knew in their primitive state, apparently as well as civilized communities, that children too much humored and neglected in moral training when young, as they grow up are apt to become turbulent and bad members of society. As one of the most effective means for training and forming the character of the Indian youth, fasting seems to have been established and practised from time immemorial, and prevailed, I am led to believe, universally among the Indian tribes of this continent. As soon as children were thought capable of reasoning they were required to practise fasting, until they were married. Besides their regularly abstaining from food for so many days successively, at different parts of the year, they were obliged to fast before they were allowed to take any of the wild fruits of the earth, at the different seasons as they became ripe. The same rule was observed with regard to the produce of the farm.

The Indians were most exact in enforcing their rules of fasting. With young children it lasted the whole day, and if a child put anything in his mouth during the day, as, for instance, snow or a piece of icicle,—which children are very apt to do when playing in the open air in winter,—that day went for nothing, the child was then permitted to eat, with strict injunctions to renew his fast the next day. It was also imposed as a punishment upon those children who manifested a disposition to be disobedient and disrespectful; and was found an excellent means of discipline to make children sensible of their duties, and exercised a wholesome restraint upon the youth. With young men from sixteen to twenty-five years of age it was no longer necessary to remind them of the practice. It was looked upon as a duty by every young man, who had too much honorable feeling to submit to the sneers of his companions as a worthless glutton. They, moreover, believed gluttony to be highly displeasing to the Great Spirit; and that, in order to obtain special favors from him, it was absolutely necessary to restrain the appetite. The young men frequently spent one or two months during the winter in fasting, taking only one meal in the day after sunset. In summer less time

was spent, but the fast was more severe; it lasted from two to four and even five days, according to the strength of the individual. On these occasions it was usual for the young men to withdraw from the family residence to a retired spot, under the shade of a tree, where they passed their time in fasting and contemplation. To this spot the mother sometimes repaired with a small bunch of wild, unripe berries, which she suspended from a twig about a foot and a half from the ground, so that the young man might have the poor consolation of fixing his eyes occasionally upon them. The sight of these berries had the effect of watering the mouth in the same way as we feel before tasting any unripe fruit, especially when we have reason to suspect its being sour. The dreams of the last night which terminated their regular fasting days at any time of the year, were considered the most important, and were carefully studied as revelations from the Great Spirit. In the evening small wigwams were put up at a little distance from the family residence, each just big enough for the accommodation of one person. The youths who were practising the rite of fasting had to take up their quarters in these lodges for the night, using, if possible, only new furniture. Next morning it was the duty of the grandmother, or some other elderly female, to visit the young fasters by daylight. The first thing she did was to make a very thin corn soup, or some kind of broth, after which she went to ask them one by one of their dreams. She congratulated those who had favorable dreams upon their good fortune; but for those who had unlucky dreams she threw a piece of fur of some animal on the fire, in order to avert the consequences of such ill-omened visions. The longest fast practised among the Indians lasted ten days, during which time it was indispensable that the candidates for the special honors which it secured should neither taste anything nor sleep. They were made to dance every night, and sometimes were put in small cribs suspended from the ground, which were moved sideways, like a cradle, for the purpose of inducing sleep. Those who yielded, and fell asleep, were dismissed forthwith as unworthy. Most frequently all the candidates failed; but on some rare occasions one or two succeeded in completing the time. Even with these, however, this severe undertaking seems to have exceeded the powers of nature, as those who were successful—though regarded ever after with a certain degree of superstitious veneration—never fully recovered from the effects of it. Besides fasting, the young people had to abstain from certain kinds of animal food, and from certain parts of animals, for instance, the head, the

meat near the bone, and the marrow. They were also strictly prohibited from eating blood until after they were married, when they were no longer subject to restraint. Girls were considered marriageable at fifteen, but it was customary for a young man to remain single until he was twenty-five years of age, after which he might take a wife if he liked, or rather if his parents chose.

Young girls when fasting rubbed clay on their temples, whilst the young men partially blackened their faces, or occasionally painted them with one or two other colors. This custom can scarcely fail to recall a similar one recognized among the Jews, as the disfiguring of faces on fasting days is distinctly noticed in the New Testament. Like the Jews, also, the Indians regarded several animals as unfit to be eaten; in fact, they had strong prejudices against their flesh. Among the feathered tribes, I may mention the raven, the crow, the blue jay, the owl, and many others, and amongst quadrupeds the fox, the mink, the wolf, &c.

With regard to matrimonial affairs it may be remarked that the Indians do not seem to have much appreciated what is called "keeping company" nowadays, as the choice of a wife was entirely left to the parents. The young bridegroom may never have seen, spoken to, or been acquainted with the girl until she was introduced to him as his bride. Generally speaking, when the eldest brother died, his younger brother was required to marry his widow; in all other cases it was not thought lucky for a young man to marry a widow; and in case the woman should die first her younger sister had to supply her place, provided the parties were not already married. The degrees of relationship extended a great way among the Indians; and it was prohibited by custom to contract marriage within the forbidden bounds. To give an idea of the operation of this usage, suppose that an Indian A. had a cousin B., the son of A. and the grand-daughter of B. would be placed within the forbidden degrees of kindred, and should marriage take place between the parties, the son of A. would be considered as marrying his niece. In the English language, it has often appeared to me, there is a great want of words to express the various degrees of relationship. Instead of using different words, the Englishman says my first, second, third cousin, and so on. In Indian there are appropriate terms to express the different degrees of consanguinity; even in speaking to, or of, female relatives, the same terms are not used as when speaking of the men.

Another discipline to which the young people were subjected, in

addition to that of fasting, constituted a useful training for future life. They were required to bathe at daybreak every morning for about a month in the spring, whilst the water was cold. This was done with a view to render them hardy, robust, and capable of standing all sorts of weather. Unhappily the ancient discipline by which the Indian youths were thus trained to hardihood and self-denial, is no longer practised. It is a matter of regret that the young Indians of the present day have almost entirely lost the virtues of sobriety and self-respect practised by their predecessors. Self-indulgence of the grossest kind has taken the place of self-denial. Too often they frequent the low grog-shop, where they lose all sense of shame, and are rendered mean and beggarly, as well as useless members of society. It is scarcely necessary to remark that there were good speakers among the Indians formerly; but I have too much reason to believe, that there are no such speakers to be found among them at the present day. In my opinion it was chiefly owing to their deep contemplation in their silent retreats in the days of youth, that the old Indian orators acquired the habit of carefully arranging their thoughts; when, instead of the shoutings of drunken companions, they listened to the warbling of birds, whilst the grandeur and the beauties of the forest, the majestic clouds, which appear like mountains of granite floating in the air, the golden tints of a summer evening sky, and all the changes of nature, which then possessed a mysterious significance, combined to furnish ample matter for reflection to the contemplating youth.

Having made these remarks on the youthful training of the Indians, I proceed to speak about their warlike customs, and the regulations by which they were governed in their military expeditions. In the first place it was customary for the warrior who was to be the leader to give a banquet, about six months before, at his lodge, to which those who were to form the expedition were invited. On this occasion they went through the preliminary ceremonies, such as singing songs, inviting the crows to follow and feast upon the bodies of their enemies, walking or dancing around the fire place carrying the head of some animal on their shoulder, and impregnating their food with some sort of powder. Whether this was prepared from root, mineral, or animal substance, I cannot say; but, at any rate, after the food was impregnated with it, by the principal warrior, with strange invocations, great care was taken to prevent women and dogs from tasting it, as it was said to be ruinous to their health. After this feast all remained quiet,

and the leader commenced to fast from day to day until the time for their departure arrived. In commencing their journey, if by land, the leader put himself at the head of his party, consisting generally of from thirty to forty warriors. If they had to perform a part of their journey by water, he took his seat about the middle of the canoe, where he had to stand up and sing a war song as they started, with a rattle, or medicine ball, in his right hand, made of hide, about the size of a cricket ball, having a small handle, and containing a few dry bones. When shaken it made a sharp sound, something like the noise of a rattlesnake. From the day of their setting out the war party fasted every day until noon. Their rules of war required them to be in perfect harmony with each other, never to make use of an expression which might wound the feeling of any of their party; and to abstain from all conversation about women and personal enemies at home. They were not to kill a bird, fish, or any other animal, unless required for food. Although the leader was foremost in rank, he had but little to do with the arrangements of the camp or their journey during the day. These were under the management of two other warriors of some experience. They ordered the men to rest when they thought proper, and directed them to proceed again. It was also their duty to remonstrate with the men in the evening, if any difficulty arose during the day. Many of the rules of war were of a singularly arbitrary character, in their minute requirements for averting ill-luck. It was against their rules to sit upon a log when they took rest: every man was obliged to sit upon the ground. If any one took his seat on a log, without thinking, down he went upon his back before he knew where he was, as there were men appointed to the duties of the provost marshal, with strict orders to watch and punish every one they saw transgressing the articles of war. When they came to a fallen tree they might creep under, otherwise they had to go round, as they were not allowed to go over it. They were not to take fuel or bark from the side of a tree in the direction of their journey, but only in the direction where they came from. If, sometimes, on a rainy day, they wished to take the bark from the dry side of a tree that stood towards their journey, one of them took an axe, and two others, each holding a dish filled with mud, the axe-man gave a war-whoop, and all the three ran to the tree, and as he removed the bark with haste, the other two were busily engaged in plastering the stripped portion of the tree with the mud. It was the duty of the cook to give the word to rise by daylight every morning, which all

were expected to obey instantly; any man, who thought proper to wait for a second warning, was favored with it by upsetting a kettle full of cold water over his head, when he had to rise, whether he liked or not. Before they set out in the morning they fixed their hair in a military style. In taking their meals they all commenced, and were expected to finish at the same time. On their quitting, the chief's messenger came round with a kettle of cold water, and poured some into the dish of every man. All the meat he found in them he threw towards the direction where they came from the previous day. The expedition was generally accompanied by two magicians, clairvoyants, who were supposed to be acquainted with some secret craft, by means of which, with the assistance of demons, they were enabled to discern objects at the distance of at least a day's journey all around the camp.

The practice of scalping appears to have been adopted in the first instance by the warriors in order to convince their people on their return that they had actually killed the enemy; and, to dispel all doubts, they exhibited the scalps as the best proof of their success. After the war party had accomplished their purpose, the rules were not so strictly observed, and travelling homeward the leader walked behind instead of at the head of his men. If they took any prisoners they generally brought them home, to be put to death afterwards. There were various ways of getting rid of their prisoners. One plan was to make a nest, say about ten feet from the ground, of small sticks, covered with straw. The prisoner was brought to the foot of the tree. If he was a brave warrior he gave a war-whoop, went up and placed himself in the nest. A man of less courage sometimes fainted at the foot of the tree, and the bystanders were obliged to put him in the nest. The next thing was to set fire to the nest, and as it was composed of light materials, when the prisoner fell on the ground, he was only partially burnt; his wrists were then cut about half way, and in that state he was let loose upon the crowd, and it was believed that every one he struck was doomed to die soon. Another way was to dig a hole in the ground about ten feet deep and five paces in diameter, at the bottom of which a large fire was made. In the meantime one of the crowd was sent into the woods to bring in a sapling. This was stripped of its bark and laid across the crater. The prisoner was then ordered to walk upon it, if he missed his steps he was of course plunged at once into the fiery gulf beneath his feet; but if he succeeded in reaching the other side he was immediately liberated, admitted into the community, and was from that time considered as a member of the tribe.

As to their secret societies, I believe it has been remarked by some American writer, in speaking of the Rocky Mountain tribes, that there are freemasons to be found among the Indians. I am aware that there were, and there are still, among the Pagan Indians, secret societies; but I am not informed of the particular objects of any of them. One of these societies is called "*Wahbahnoowin*," a word signifying the east; and it would appear, from what has transpired of their proceedings, that they had something to do with fire. It was asserted that the *Wahbahoog*, when fully instructed in the secrets of their order, could hold a burning coal in their hands, or plunge their fingers into boiling water, without receiving any injury; that it was one of their ceremonies to introduce red hot stones into their temporary wigwam, and pour water upon them, for the purpose of enjoying the steam, the heat of which was enough, it is said, to suffocate any one not used to such operations.

Another system was called *Tchissahkkiwin*, and another *Gosahbahndahnwin*. But the most important society was called *Metaowin*. Although there might be members throughout the whole tribe, still each particular lodge or section consisted of eight brothers or members. Its votaries had some secret to keep; and they were said to have secret signs and words which no one could understand but themselves. There is no doubt that they practised great deceptions upon the multitude. Still the old members were feared, as they were believed to be well acquainted with the mysteries of their order, which knowledge furnished them with means of getting rid of their private enemies whenever they pleased. Of their proceedings in their assemblies, at which only members were allowed to be present, I believe nothing was known positively. But in their open assemblies, which took place in a large wigwam, and sometimes in the open air, hey went through some of the ceremonies. If in the open air, the pace for operations was about fifty feet long, and about fifteen bread, around which the members sat dressed in their fineries, each holding in his hand some stuffed animal. Whilst some of them kept dancing in the middle, the old fellows ran round the space, holding before them stuffed birds or other animals. From the appearance of some of these articles they may have been handed down through successive generations among the forefathers of the performers. Many of the quadrupeds had scarcely any hairs upon them, and the birds were quite destitute of feathers. Yet the excitement became so great during the ceremonies that many of them, as it appeared to the c-

lookers, began to revive, and the bystanders could plainly hear the squeaking of the hawk and the whistling of the otter. The *medawahg* sometimes put small bones in the mouths of their animals, and shot them into the mouth of one of their brothers, or into that of some spectator. These and other performances were looked upon as great wonders by the uninitiated.

But, unfortunately for the brotherhood, in course of time, the unconquerable industry of the curious succeeded in discovering the secret which caused the animals to revive and sing. This was none other than a small whistle, so fixed in the stuffed animal as to send forth noise through the mouth when pressed between the fingers and the thumb. But the trick of making bones fly in any required direction, though seemingly more simple, was never fully detected. Some pretended it was done by the influence of a powerful medicinal root, perhaps mineral, which possessed the property of driving out with force any small substance when brought into contact with it. It was reported that when the *medawahg* of a particular section got rid of a personal enemy, one of them visited the grave on the eighth night, disguised as a wolf or bear, dug up the body, cut off one of the little toes, the little fingers, and the tongue, and also took out the heart. At their next meeting the tongue was divided into eight shares, and eaten by the brothers. The other parts they made use of in preparing their medicine and deleterious drugs. The practice of mutilating their victims has been proved by examining the body, when there were strong grounds of suspicion of foul play, and by relatives occasionally inflicting a deadly wound upon the Meda, whilst in the very act of mutilating the dead. It has been noted as somewhat strange that he always managed to get home before he expired.

Notwithstanding their imperfect idea about the future world, the Indians believed in the existence of the soul, and there are words in their language signifying "resurrection" from the dead. They also believed that there was a place in the west, — a place of delightful climate, having beautiful trees, flowery meadows, limpid streams, and rich hunting grounds, where the virtuous people went after death to enjoy the good things of the land. There they had nothing to do but to amuse themselves in the midst of plenty. From this region the wicked were excluded. They had to wander about this world in poverty and misery; but, in order to gratify their unrelenting malignity, they were sometimes transformed into mosquitoes, or other noxious insects, that they might annoy the living, as it was their

pleasure to do in their own lifetime. I think, also, there is a shadow of the doctrine of transmigration in some of their ideas. They thought that the dead could partake of the good things of this world. Hence some were in the habit of throwing meat, sugar, or pouring whisky in the fire for their departed friends.

Some of my readers are no doubt aware that *Manido* is the term applied by the Indians to a superhuman being; but more especially to the Supreme Being. The last syllable of this word should be "*do*," not "*to*." If the vowels are pronounced according to the English alphabet it would be necessary to write the word *Mah-ni-do*, in order to enable any English reader to pronounce it properly. In adopting the French pronounciation of the vowels it is not, of course, necessary to make use of "h" in writing the word, and it would be *Ma-ni-do*. The English word "God," I believe, signifies "good." But our Indian word "*Manido*," denotes terror and irresistible power. And it appears to me rather a remarkable circumstance, by no means to be overlooked by the inquirer into the origin of the Indians of this continent, that the Seiks in the northern part of Hindostan, — in fact, all the Hindoos, if I am not mistaken, — call their Supreme God, *Mahadeo*, when viewed in the light of Destroyer. That these two important words, *Mahnido* and *Mahadeo*, should resemble each other in sound and in signification, is, in my humble opinion, not altogether the result of chance.

I would further state that I have often been asked by white people to explain the meaning of the word *Manitoulin*, the name of the large island on the north-west side of Lake Huron, and said to be so called by the Indians, according to geographical writers. As far as I know, there is no such word in the languages spoken by the Odahwahs, Ojibwas, or any of the surrounding tribes. *Manitoulin* may be a Huron word: but, not being acquainted with the Mohawk, which, I understand nearly resembles the Huron or Iroquois language, I cannot say positively, but so far as I can see by their alphabet, and printed books in their language, they never make use of the letter L, which is also wanting in the Odahwah and Ojibwa alphabet, besides F, R, V, and X. It is true there is a bay towards the south-east end of this island which we call *Manidowaning*. Of the meaning of the word *Manido* I have already endeavored to give an idea. The other part of the word, viz. *waning*, signifies a hollow or cavern, because there is a certain part of the bay of which the Indians say they never could find the bottom. They often made the trial in winter, by letting down

their decoy fish, — which is made of wood and loaded with lead, so as to cause it to sink, — to reach the bottom of this mysterious abyss; and in accordance with their simple ideas they thought it was a hollow, inhabited by some Manido or sea-god. From this circumstance they called that particular spot *Manidowaning*, which name was afterwards applied to the bay itself. Had the island been called Manido Island, the name would be perfectly intelligible, and in my opinion it was so called originally by the white people; but the word Island was afterwards contracted into the syllable "*lin*," and by adding another island after it, the name was completed, and rendered more harmonious by the intrusion of consonants between the initial letter of the second word and the final vowel of the first.

The Indian name of this Island is *Odahwah-minis*, that is to say, Odahwah Island, because it was occupied by the Odahwah Indians about the time that America was discovered in the fifteenth century; and according to their tradition, it was from this place the tribe sent a party of their warriors to Montreal, when they heard that extraordinary people had arrived at that place, who had many things to sell, for all who wished to trade with them. When the party came back, their canoes were loaded with all kinds of articles they got from the French, or *Wamitikgoshe*, as they called the first white people they met with, from the circumstance of their keeping their things in wooden boxes. The word *Wamitikgoshe* is applied to all white people, but more particularly to the French. It is derived from "*mitig*," a tree, or a piece of wood, and "*wahsh*," a hole in the ground where foxes burrow or squirrels deposit their provisions. So the first Indian visitors to the French, in endeavoring to give a description of the people they saw, on their return, explained that the wonderful beings they met with, kept their goods and provisions in hollow places, but instead of digging holes in the ground like squirrels, they took the trouble to put several pieces of wood together, in the shape of a hollow tree sometimes, fastened with hoops, where they kept their provisions. The Odahwahs continued to reside on this island until they conquered the *Mushkodenj*. Why they attacked that tribe I will explain in a few words. The Odahwahs were at war with the Winibigoes at that time, who then occupied the region north-west of Lake Michigan. One time they were unfortunate, and on their way home they called at the Mushkodenj village, and, as it was customary, they sang a mournful song as they approached the village, to let the people know that they had been defeated. Some thoughtless youth, when he heard

them sing, called out that they were served right, they had no business to go to the place where they had been defeated. These words went to the heart of the leader. They landed and enjoyed the hospitality of their friends for two or three days, then proceeded homeward. When the war chief got home he told secretly to a few of the chiefs what had occurred at the Mushkodenj village. They labored together until they gained a majority of the war chiefs to their side. They then informed the whole tribe of their determination to make war upon the Mushkodenj in the following summer. The Civil Chiefs did everything in their power to prevent the war, but their efforts were useless. The Odahwahs have never relinquished their claim to Manitoulin Island, and their right has been always acknowledged by other Indians. It will, therefore, be easily understood why a portion of them removed to that Island, the home of their ancestors, when their territory was sold to the Government of the United States. There is a branch of the Indian Department on the west side of the Manidowaning Bay, established about twenty years ago, it is said for the purpose of promoting civilization, education, and industry among the Indians; but, in consequence of a blunder made at the very commencement, it was apprehended by impartial observers that it would not be attended with success, and I understand the establishment has almost entirely failed in its object.

Saugeen, or Suggeen, as some people would have it, I believe, professes to be an Indian word. If so, in order to make sense of it, the letter *g* should be added at the end of the word, and it would be more proper to write and spell the name *S a h g i n g*, and the length of its pronunciation should be about the same as that of the word "seaking." It may be rendered in English, the "outlet," or the "mouth of a river," though it is not the correct translation. The word is derived from *Sahkum*, which in Odahwah signifies to come out. In Ojibwa the *k* is changed into *g*, and another syllable added, and the word is written and pronounced *Sahgakum*. *Sahging* is a participial noun, and implies motion as well as an open space, and every river has its *sahging*, or outlet.

The word Nottawasaga should be written *Nahdowa-Sahging*. It is a compound word and means a place where the *Nahdowag*, viz. the Mohawks or Iroquois used to come out. The Odahwahs were also at war with the Nahdowag or Iroquois during their stay at Manitoulin Island, and the Nahdowag, in their hostile expedition against the Islanders, used to go out into Lake Huron or Georgian Bay, by the

Nahdowa Sahgi-River, until they got two or three severe defeats in the vicinity of the Blue Mountains, by Sahgimah, the most celebrated warrior of the Odahwahs at that time. Instead of waiting for the Mohawks at the Island, he used to come and meet them at the Blue Mountains, hence that place is called to this very day, *Sahgimah Odahkahwahbewin*, viz., Sahgimah's watching place. The last time he met the enemy there he found them occupying his watching place. In the evening he went to view their camp alone, he saw their arms piled about the camp as if they suspected no danger, whilst their warriors were feasting and dancing. He then went for his men, and on his return he found the Mohawks had retired to rest. Having placed his men in order, ready for attack, he entered the camp alone, and removed the arms of the slumbering enemy. The Mohawks being without arms were, of course, slaughtered, except a few who were spared on purpose. The Odahwahs cut off the heads of the slain, and fixed them on poles, with the faces turned towards the Lake. Sahgimah then selected a canoe, which he loaded with goods, provisions, and ammunition, put the survivors in and told them to go home and never to come there again; he also desired them to say when they got home that they had met Sahgimah on the top of the Blue Mountains, where he fixed the heads of their companions on poles, with the faces turned towards the Lake, and that he declared his determination to fix in a similar manner, the head of every Mohawk that he might fall in with in that quarter.

SCALE FOR THE COMPUTATION OF AREAS OF IRREGULAR FIGURES.

BY THOMAS HECTOR, C. E.

Read before the Canadian Institute, January 30th, 1858.

Having been frequently called upon in the routine of that branch of the Crown Lands Office to which I belonged in the year 1842, to calculate the quantities of land contained in irregular figures, it struck me that a set of transparent scales subdivided into parallelograms and squares, accurately framed, to correspond with the usual scales

upon which the Government maps are drawn, would facilitate the operation of computation, and be much less liable to inaccuracy. I drew the scales upon tissue paper, and laying them over the island or broken frontage, of which the contents were required, I had only to count the acres covered by the squares, adding parts of acres where the lines intersected the squares.

Long use of this instrument has proved not only to myself but to others in the office, that the eye in judging of the parts of acres, in this method, is more to be relied upon than in the usual manner of computation by square and compass.

I am induced to lay this communication before the Canadian Institute for the purpose of its being more generally known, as I believe it would be found highly useful to engineers and surveyors in their general operations; and I am led to think that the idea has not occurred to others from the fact, that upon sending to New York and subsequently to England, for the purpose of the scales being made in horn, it was not without difficulty that the execution of the order was obtained. A short time since a gentleman who has attained to very high honors in the Mathematical sciences in Paris, M. Coulon, informed me that the head engineers in France verify the calculation of the area of irregular figures, by cutting out the figures in paper of a known weight. He at once admitted the superiority of this scale, both in accuracy and celerity of calculation.

I have lately been informed that all the computations of irregular figures in the surveying and drawing branch of the Crown Lands Department have been effected, for some years past, through the instrumentality of this scale.

Since offering this communication to the Institute, it has been stated to me, for the first time, that a similar instrument to that which forms the subject of this paper was, about thirty or forty years since, used in the Government trigonometrical survey of Ireland.

But I have yet to learn that it is now in general use, notwithstanding its great advantages: the law for its construction allowing of illimitable enlargement and divisibility in regard to scale.

CONSIDERATIONS RESPECTING ANOMALOUS VEGETABLE STRUCTURES.

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Read before the Canadian Institute, March 6th, 1858.

The rational interest belonging to the abnormal forms which occasionally offer themselves to our notice in the vegetable kingdom, and the possibility of applying them to the detection or illustration of important general principles are now generally recognized, and we could scarcely open any recent Botanical work without finding some attention bestowed upon the subject; yet it appears to me that justice has hardly been done to it, either by the simplicity and clearness of its treatment, or by exhibiting it as affording one of the most striking and attractive aspects of Botanical science. Having had my thoughts turned to the subject, soon after it was first brought into notice; having diligently collected vegetable anomalies for a series of years, and having at one time possessed a very remarkable assemblage of them, some of which I have from time to time described in communications to the British Association and the Linnæan Society, I propose to lay before the Institute a summary of the results of my studies in this department. I have not neglected any aids to be derived from the labors of others, but I have endeavoured to look into nature for myself, and to form my conclusions by careful induction from recorded and observed facts. Some little novelty there may be both in my method of treatment and in the theories proposed, and where I agree most closely with others, I do so as one who has watched the progress of opinion on these points almost from the beginning. I have collected evidence for myself as well as weighed what was produced by others, and rest my belief on my own acquaintance with the facts, not on any authority howevever respectable.

All intelligent study of abnormal structures proceeds on the assumption that they are not mere random and insulated facts, but exemplify the operation of some force or tendency which belongs to the being, and is constantly active, but in ordinary cases is either kept in check by other influences, or allowed to manifest itself more fully than in the special instance. Hence the anomaly is not unmeaning, but may be made to unfold a hidden truth respecting the parts, at least rudimen-

tally, present in a particular structure, or an important general law respecting the influences which modify outward forms, and the circumstauces which are common to them through all variations.

Every specific type essentially consists in a certain association of organs, constructed on a fixed plan, disposed in a definite order, nourished equally or unequally, as the case may be, and subject to different degrees of pressure on each other from causes which can, often at least, be understood. Such elements, as the number of *phytons*—whether one or two—forming the plant, the mode of provision for its early nourishment, with or without albumen in the seed, the natural order of the leaves, their peculiar *venation*, and mode of folding in the bud, with the consequences of these, are constant and unchangeable, but it is easy to conceive that from abundance or deficiency of nutriment, and from various causes, internal as well as external, the equal development of the organs, and their nearness to each other may be greatly affected. Now we certainly know that parts greatly deficient in nutriment although rudimentally present, remain undeveloped and are either not seen at all or present an altered appearance, and we know that whenever two vegetable organs are brought close together, whether at their edges or by their whole surfaces, they become connected by cellular tissue so as to form apparently one part. Again, the whole of every vascular plant is made up of root, stem and leaves, with their modifications. Flowers are only buds in which the internodes are suppressed and the leaves are developed in a peculiar manner to suit a special function. As therefore, in a great many plants the extent to which leaves continue to be produced from one bud is uncertain, we see the reason why the number of circles of parts in a flower may vary, and it is obvious that increased or diminished pressure of the circles on each other must affect both their magnitude and their connection or separation, whilst peculiar pressure must tend to reduce the number of parts in a circle, and an unequal distribution of the nutriment to enlarge some at the expense of others. There are cases in which two or more buds originating near each other may be united from their first production, and have their parts combined so as to produce a composite branch or flower, the cause being the same which produces the coherence of adjoining organs in one circle of a flower. The distinction between the several parts of a flower is only a difference of development, every leaf being in its origin capable of assuming any of the forms. Of course when the whole or any portion of one circle of parts assumes a different character from that which

it usually presents in the species an anomaly or monstrosity is produced. These principles will, I believe, be found sufficient for the explanation of all vegetable anomalies excepting those of colour, which are as yet imperfectly understood, and they show that all, however apparently differing, amount to variations of development of the organs belonging to the specific type, there being a tendency characteristic of the species to full or diminished, to equal or unequal development, and the anomaly being an alteration in the individual case from some cause acting peculiarly upon it. Sometimes we perceive the cause, frequently it is hidden from our view, and we only know it by its effect, but a little experience guides us safely in its determination. In an earlier state of the science abnormal forms either only excited a vague wonder, or were even regarded with some dislike as interfering with the characters of species or the rules laid down for their examination, whilst the fondness of mere cultivators for some of them on account of their rarity or beauty was considered as a proof of their ignorance. Yet no objects can be contemplated more rich in instruction, more fruitful of suggestions for improving our acquaintance with the real structure of plants than these occasional deviations from their natural characters. We inquire what the change really is which has taken place, and how it may be brought within the range of a law as real and as uniform as those on which the ordinary appearance depends, but usually less exposed to our observation and therefore the more interesting. Take for example the case, of not very uncommon occurrence in cultivation, of a Fuchsia, whose regular number of parts in the flower is four in each circle, being found to have five parts in each. We readily apprehend that an unusual supply of nutriment has produced the phenomenon, but how or why? Is number in the circles of flowers variable without rule, or would the abundance of nutriment cause the production of additional parts having no relation to the symmetry of the flower? All our experience is against such suppositions. Let us, however, recollect that five is the normal number of parts in each circle in Exogenous plants, and that when in such plants the number four or a less number habitually occurs, botanists attribute the reduction to a degree of pressure causing abortion of one or more parts rudimentally existing. We might then confidently anticipate that in a regular flower with only one part deficient an increased supply of nutriment would sometimes restore the missing part as well as enlarge the others, and the law of alternation being constant in such structures as this, we should expect that one circle having five parts all the others would

follow the same rule. Thus, the anomaly is an illustration and confirmation of a law, known by other means and of essential importance for the right understanding of the plan of a flower.

For affording striking proofs of the general laws of structure, for overcoming peculiar difficulties attending the explanation of particular cases, and, with the aid of the study of embryonic development, and of the homologous parts of other, more especially of kindred, species, for unfolding obscure, but most interesting theoretic principles, we have no method so efficient as the study of anomalies; and it is not too much to say that much of the philosophic interest communicated to botanical science of late years is derived from it. The variety of anomalous forms is so great, that without a clear arrangement, we cannot hope to take a comprehensive view of their nature, and the applications of which they are susceptible. In conformity with the views I have given of the causes of anomalous developments, I think they may all be reduced to three classes, the first consisting of cases in which the development is diminished, the second of those in which it is increased, and the third, of those in which its direction is altered; a fourth class would include those which depend on internal changes in the contents of the cells, producing unusual modifications of colour, but these I shall not further notice at present. The first class may be subdivided into 1. Suppression of organs, 2. Degenerescent transformations, and 3. Separations of parts. In the second class we have, 1. Reappearances of parts rudimentally existing, but which are normally suppressed in the species; 2. Comparative enlargement of particular circles; 3. Transformations due to increased development; 4. Coherences and adherences; 5. Multiplication of circles; 6. Production of extraneous appendages to particular organs. In the third class we have: 1. Cases of irregularity where the usual structure is regular; 2. Cases of return to regularity in species usually irregular. All these secondary divisions may be further subdivided according to the part affected, and we have thus a view of the whole subject, exhausting the possible cases, and presenting them in an order of mutual relation such that the mere reference of each case to its proper position implies the attainment of much valuable knowledge.

To give by description and figures examples of each class and subdivision would occupy too great space, without the objects brought forward being generally new. I rather select a few examples illustrative of the importance of anomalies in suggesting or confirming theoretical truths, or explanations of structures otherwise unintelligible.

The difference between regular and irregular flowers was once thought much more fundamental than it is now known to be. The study of abnormal examples aided by the consideration of analogies, has opened to us the true view of the subject. Thus I cultivated for years a variety of the checkered tulip (Fritillaria meleagris), which instead of the regular bell usually presented by the flower, had the stamens declinate, and the perigonium with one piece above two pairs lateral, much modified in size, and one piece below, so as to approach the shape of the flower of the Jacobæan lily; finally, the rich soil of the garden caused the bulbs to produce flowers of the ordinary type. It is very common for particular flowers of Pelargonium, (the greenhouse geranium,) whose flowers are known to be usually irregular, to return to the regular type, thus losing the peculiarly coloured upper petals and the nectariferous tube attached to the pedicel, and, instead of the seven unequal stamens usually seen, perfecting ten equal stamens, as is done by an ordinary wild geranium. Again, Linaria or toad-flax presents a remarkably irregular flower, the stamens being in two pairs, as in the Linnæan class Didynamia, the corolla forming two lips, in the manner termed personate, and the lower part having a single pointed tail, but there is a well known variety of this flower, called by Linnæus, peloria, (the wonder) in which the corolla is regular with five equal parts, has five smaller tails, and contains five equal stamens. I have had in my own possession peloria varieties of several species of Linaria, and in one instance the compound spike of flowers had all the terminal flowers peloria, the lateral ones of the usual irregular structure, obviously because the terminal flower, was favourably situated for the fullest and most equable nourishment. I may with advantage refer to one other example, interesting from the unusual character of the deviation. We all know the remarkable irregularity of the flowers of the orchis tribe, in which only one of the stamens is perfected, and that in close adherence on the column formed by the united styles, and one of the petals called the lip, receives a remarkable development, often assuming very fantastic forms. Now there has been a case described and figured by Richard of a flower of Orchis mascula, which was actually completely regular, with three equal petals, three stamens bearing anthers, and the whole flower symmetrical and perfect, as complete an interpretation of the meaning of irregularity as could well be conceived of. These facts are sufficient, without my dwelling on a series of curious analogies, to prove that regular and irregular flowers differ only in the equal or unequal distri-

bution of the nutriment, as affected by internal or external causes, and that while some natural families have an exceedingly strong tendency to irregularity, and others hardly ever indulge in it, there are some of intermediate character, in which a change is easily effected, and abnormal conditions often occur, fully explaining the nature of the phenomenon.

The origin of all the parts which unite to form the flower from leaves is now a well established principle, and the student is from the first led to regard a flower as a bud modified as to its mode of development, in order to its application to a special purpose; but abnormal examples, in which all the floral circles are converted one into another and to leaves, afford the readiest and most convincing proofs of the principle, and illustrate it most pleasingly.

I have had an anomaly in which the leaves were half transformed into the several floral organs irregularly intermixed, carpels being formed near the exterior. I have had cases of the whole of the floral circles being converted into leaves while retaining their position in crowded circles; I have had petals changed into stamens, as well as stamens into petals, and exhibiting all intermediate states; I have had stamens with imperfect anthers at their sides, terminating in a true stigma, and enlarged below for the production of germs, carpels changed into green leaves, and into petaloid processes; I have had abnormal approaches of ordinary leaves to the figure of a carpel, and the production of germs; and finally, instances of growing buds in the axes of the petals, and various degrees of elongation of the axis between the circles, and of its passing on to produce leaves and buds beyond the flower. Such a series of examples establishes beyond question the whole theory of the floral organs.

I have referred without hesitation to the principle as being well established, that organs, distinct in their origin and perhaps in their functions, when brought near each other, either by their margins or their surfaces, will unite so as to assume the appearance of a single organ. This explains the nature of such flowers as convolvulus, campanula, and innumerable others, as well as of such fruits as the apple, orange, &c., hence the old terms *monophyllous* calyx, *monopetalous* corolla, are discarded by all accurate botanists, as conveying a wrong idea. De Candolle has proposed *gamosepalous* and *gamopetalous*, as terms to take the place of these. I prefer, as simpler and more directly conveying the idea, *synsepalous*, *synpetalous*, *syncarpellous*. But, however well established the theory of coherence of parts may be,

it will not be uninteresting to refer to some of its proofs afforded by anomalies, some of these common enough, others of rare occurrence. There can be no proof of the nature of a synpetalous corolla equal to that of our occasionally seeing it resolved into its several parts. Observation on the different degrees of the union in different flowers will go far, but there is no resisting the sight at one time of a Convolvulus, at another of a Campanula with five distinct petals; yet both of these have occurred to myself, as well as various incidental connections in the foliage. Among the latter, one deserving of notice occurred in a coherence of two leaves, normally alternate, but in this case becoming opposite, of Polygonatium multiflorum (the common Solomon's seal) which together formed a sort of bag around the stem, so checking the further growth that only a feeble shoot protruded at the narrow opening, a bent and contracted portion being easily traced within the bag. Another instance may admit of useful application. It occurred in the common tulip, the usual leaf on the stem cohering by its edges so as to envelope the flower completely. With the progress of growth the force of vegetation directed upward burst the enveloping leaf as completely as if it had been horizontally cut by artificial means, carrying with it the upper portion like an extinguisher over the flower, and leaving the lower as a cup-shaped leaf surrounding the stem. Whether the upper piece would have stifled the flower, or the latter would have finally burst it open and thrown it off cannot be known, as I was so fortunate as in this condition to obtain possession of the specimen. It beautifully illustrated the nature of the calyx of Eschscholtzia, in which it is a union of *two* sepals, and in Eucalyptus in which it is composed of *five*; it explains likewise, the calyptra of mosses, and perhaps the opening of the fruit in Anagallis and Lecythis. Its application in the latter case depends on the assumption that the central column retains its power of progressive growth after the outer wall of the capsule which has the calyx adherent on the carpels has lost it. In this case the force of vegetation must produce a horizontal separation exactly in the place where it actually occurs.

I shall only add one other illustration at present. It is received as a principle, that though modified in particular instances, by effect of pressure or irregularity, the number three prevails in the circles of parts of monocotyledonous or endogenous plants; five in those of dicotyledonous or exogenous plants. Some learned botanists contend that the monocotyledonous structure proceeds from a single plant element (named a phyton), whilst two of these are combined in the dycotyledonous structure. Assuming this view, which is highly rea-

sonable and probable, an observation made on a series of abnormal forms enables me to give a reason for the curious numerical relation in the circles of parts in the two great series of plants, already as a fact determined by observation. If each phyton tends to produce circles of three, and two are combined in the dycotyledonous plant, we consider that there are six parts to be accounted for in each circle of a dycotyledon, and we ask for an explanation of the actual number being only five. I have examined a great many cases of two, and one of even four flowers so adhering together as to become one, and attending particularly to the number of parts in the circles, as compared with that of a single flower of the kind, I have found occasionally under peculiar pressure two parts lost in the union, one at each point of junction, but much more usually, so as to give a general rule, one part lost in each united circle. Thus, in monstrous Irises formed by a union of two flowers, five parts appear in all the circles, or reduced to four in the inner circle of the perigonium; in monstrous Oenotheras, there are found seven parts each in the calyx, corolla and carpels, and fourteen in the stamens. If then the natural course is for a union of two circles into one, to be accompanied by the extinction of one part, we at once derive from the union of two phytons, each giving three parts to a circle, the number five, as the normal number for dicotyledonous plants, while the occasional loss of two parts in the united circle, under greater pressure, explains the commonness of the number four in this class of plants. Hence, the number of parts characteristic of the great divisions of the vegetable kingdom, is no longer a mere empyrical observation, but a principle traced to its cause, and accompanied in its announcement by a rational explanation. I am withheld by the fear of occupying undue space from extending these remarks, which I can only state are few and short, compared with the materials which present themselves.

NOTE ON EUCLID, PROPOSITION 5, BOOK I.

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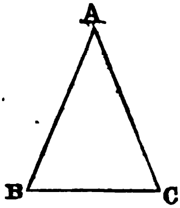
Read before the Canadian Institute, 20th February, 1858.

The 5th proposition, proving the equality of the angles at the base of an isosceles triangle, admits of the following immediate deduction as a corollary to the 4th proposition.

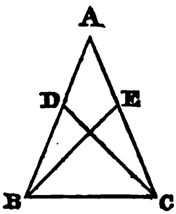
Let A B C be a triangle having the side A B equal to the side A C. Then the angle A B C shall be equal to the angle A C B. For because A B is equal to A C, the two sides B A, A C are equal to the two, C A, A B, each to each, and they contain a common angle; therefore the angles are equal to which the equal sides are opposite; therefore A B C is equal to A C B. Q. E. D.



The only objection which I can imagine to be raised against this proof is that we cannot compare a triangle with itself by superposition, and consequently this method of demonstration is a departure from Euclid's *method*. For of necessity the question could only be one of *method* not of abstract truth.

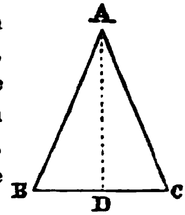
I would submit that Euclid himself by no means restricts the application of the 4th proposition to triangles capable of superposition, in fact the ordinary proof twice compares triangles having a *common part*, and which could not possibly be superimposed, and propositions 6 and 7, &c. afford instances of the same—proposition VI a remarkable one.

The demonstration given above is a particular case of one given by Proclus in his commentary, he takes the points D E in A B, A C, and the proof follows the same order as that given by Euclid. It will be at once evident that if D and E coincide with A, the angles A C D, A B E vanish, and it is no more a departure from Euclid's method to prove the equality of A B C to A C B than of E B C to D C B since the triangles D B C, E C B could not be proved equal by superposition; or more simply still we may consider it to be what both Euclid's and Proclus' constructions become when D, E are coincident with B, C. Not that we are to suppose that they anticipated any such pushing of their constructions to the limit, all we wish to infer is, that *they considered their case proved whenever they had two respectively equal sides containing equal or common angles*, whether these sides could be superimposed as in proposition IV or not, as in most other cases.



The following elegant proof of the proposition, which is *logically* true, is liable to serious objections as a real departure from Euclid's method. I know not to whom it was originally due, but it is published in a slightly different form in the edition of Euclid in Messrs.

Chambers' course. Whether it be possible or not, imagine a line drawn bisecting the angle A, then applying the 4th proposition to the triangles B A D, C A D, the angle B is at once shewn equal to the angle C. But the equality of B to C does not in the least depend on the possibility of drawing A D, and it would be just as much equal if A D were erased, i. e., if it had not been drawn.



This proof could not be admitted because Euclid commences with three postulates, and does not allow any line to be drawn, or supposed drawn, without having two points to draw it through. Another proof also published by Messrs. Chambers, is obtained by imagining another triangle equal in all respects to be compared with the original one, but this also is not admissible, because we have as yet no means of drawing such triangle; if, however we consider such triangle to be merely a *back view* of the original one, or the hole out of which the triangle has been cut, there may be no objection to it as a *proof*, although as a *method* we prefer the demonstration given above, which does not involve rotation or other mechanical artifice, or effecting of geometrical construction in a manner not admitted by Euclid.

REVIEWS.

Geological Survey of Canada. Report of progress for the years 1853–54–55–56. Printed by order of the Legislative Assembly: John Lovell: Toronto, 1858.

Notwithstanding the dearth of dramatic incidents and matters of striking or adventitious interest connected with the Province during the last ten years, it is patent to all who have reflected upon the subject, that a much larger share of European thought has been accorded to Canada during that period, than at any previous epoch within the present century. This, of course, has arisen from a combination of various causes; but amongst these, it may be safely asserted, that the labors of our Geological Survey have played no unimportant part. The references that have been made to these labors by various leading authors in Great Britain, France and Germany, more especially, and the extracts and quotations from the Reports which one continually sees both in home and foreign journals, are sufficient to establish this,

without allusion to the place of honor held by Canada in the great exhibitions of London and Paris: a place, be it remembered, mainly due to the merit of her mineral collections as developed by Sir William Logan and his able coadjutors. Owing to the pressure of extraneous work, occasioned by the engagements of the Director of the Survey in connexion with the more recent of these exhibitions, the Reports of four years (1853–54–55–56) are published collectively in the present volume. The Report for 1857, we are glad to learn, is already in the printers' hands, and will shortly be issued. The goodly volume before us, containing five hundred pages of closely printed matter, comprises a long Report from Sir William Logan; four Reports from Mr. Murray, accompanied by a collection of large and carefully constructed maps; valuable Reports from Mr. Richardson and Mr. Billings; and four Reports of much interest from Mr. Hunt.

The report of Sir William Logan relates chiefly to the distribution of the crystalline limestones in the Laurentian Rocks of Grenville, Harrington, Wentworth, Chatham, and some adjacent townships. The accurate delineation of these limestone bands is not only of importance in an agricultural and economic point of view, but it is also of essential moment in enabling us to obtain a correct knowledge of the structural peculiarities of Laurentian districts in general. As Sir William observes, "the Laurentian rocks, stretching on the north side of the St. Lawrence, from Labrador to Lake Superior, occupy by far the larger share of Canada; and they have been described in former Reports as sedimentary deposits in an altered condition, consisting of gneiss interstratified with important bands of crystalline limestone. The gneiss proper, when it approaches the surface, yields but an indifferent soil, while the soil derived from the limestones, which are usually in a disintegrated condition, is of a most fruitful description. The farms which have been established on the Laurentian formation, run almost wholly on the limestones and their associated strata, and afford a pretty distinct proof that the distribution of these calcareous bands being once known, it would not be difficult to determine in what direction it would be most judicious to push settlement. It is also in contact with these limestones, or near them, that the iron ores are found, which so prominently characterise the Laurentian series, as well as the lead-bearing veins belonging to it; and as the limestones possess external and internal characters which render them more conspicuously distinct from the gneiss than any of the component members of the gneiss are from one another, they afford the least difficult

means of tracing out the physical structure of the Laurentide district."

The more important details of this Report, have already appeared in the *Canadian Journal*, in the form of separate papers communicated by Sir William Logan; * but the following additional remarks on the economic capabilities of the limestones and lime feldspars of the gneissoid rocks, will be read with much interest:

The crystalline limestones of the Laurentian series are quite as good for all the economic purposes to which carbonate of lime is applied, as the earthy limestones of the fossiliferous formations. It is from the latter, however, that is obtained nine-tenths of the material used throughout the country, for the very good reason that more than nine-tenths of the works of construction, both public and private, are raised upon the fossiliferous rocks, and for such present works, these rocks therefore afford the nearest sources of supply. Thus the inhabitants are well acquainted with the aspect of the fossiliferous limestones, and can easily recognise them, but very few of them understand the nature of the highly crystalline calcareous beds of the Laurentian series. Hence it is that settlers in the back townships, who have dwelt many years upon these rocks, have been accustomed, when in want of lime for the manufacture of potash, or the construction of their chimneys, to send to the fossiliferous deposits for it—the distance being sometimes thirty miles—when it might have been obtained at their own doors. In following out the calcareous bands of the gneiss district, in 1853, therefore, especial pains were taken to point out their character to the settlers, wherever exposures were met with; and in visiting some of the same localities last season, I had the satisfaction of finding lime-kilns erected, and lime burnt in four of them.

The fossiliferous rocks, in a large part of Canada, maintaining an attitude approaching horizontality, give a much more even surface than the corrugated series coming from beneath them, and this, combined with a generally good soil, renders them more favorable for agricultural purposes. It is over them, too, that the River St. Lawrence maintains its course, affording an unrivalled means of exit for the produce of the land, and of entrance for the materials that are to be received in exchange. It is only a natural result of these conditions that the area supported by the fossiliferous rocks should be the first settled. This area, however, constitutes only between 60,000 and 80,000 square miles, while the whole superficies of Canada comprehends 330,000 square miles, or about five times the amount.

Four-fifths of Canada thus stand upon the lower unfossiliferous rocks, and it becomes a question of some importance, before it has been extensively tested by agricultural experiments, to know what support this large area may offer to an agricultural population. An undulating surface, derived from the contorted condition of the strata on which it rests, will more or less prevail over the whole of this region; but the quality of its soil will depend on the character of the rocks from which it is derived.

* See ante, Vol. II. p. 439, Vol. III. pp. 1, 107.

These rocks, as a whole, have very generally been called granite, by those travellers who with little more than casual observation have described them, without reference to geological considerations. The ruins of granite are known to constitute an indifferent soil from their deficiency in lime, and hence an unfavorable impression is produced in respect to the agricultural capabilities of any extended area, when it is called granitic. Such soils are however never wanting in those essential elements the alkalies, which are abundant in the feldspars of the granite.

In the Reports of the Survey, the Laurentian rocks have been described in general terms as gneiss, interstratified with important masses of crystalline limestone. The term gneiss, strictly defined, signifies a granite with its elements, quartz, feldspar and mica, arranged in parallel planes, and containing a larger amount of mica than ordinary granite possesses, giving to the rock a schistose or lamellar structure. When hornblende instead of mica is associated with quartz and feldspar, the rock is termed syenite, but as there is no distinct specific single name for a rock containing these elements in a lamellar arrangement, it receives the appellation of syenitic gneiss.

Gneiss rock then becomes divided into two kinds, granitic and syenitic gneiss, and the word gneiss would thus appear rather to indicate the lamellar arrangement than the mineral composition. Granitic and syenitic gneiss were the terms applied to these rocks in the first Reports; but as granite and syenite are considered rocks of igneous origin, and the epithets derived from them might be supposed to have a theoretical reference to such an origin of the gneiss, while at the same time it appears to me that the Laurentian series are altered sedimentary rocks, the epithets, micaceous and hornblendic have been given to the gneiss, in later Reports, as the best mode of designating the facts of mineral composition, and lamellar arrangement, without any reference whatever to the supposed origin of the rocks. When the general term gneiss therefore is used, it may signify both kinds, or either; and the epithets micaceous and hornblendic are applied to the rock to indicate that the mica greatly preponderates or excludes the hornblende; or the hornblende the mica.

In no part of the area included in this Report is hornblende completely absent from the gneiss, and sometimes it predominates over the mica; hornblende contains from ten to fifteen per cent. of lime, so that the ruins of the rocks of the area, such as they have been described, whether gneiss, greenstone, syenite, or porphyry, would never give a soil wholly destitute of lime. Of this necessary ingredient, the lime-feldspars would be a more abundant source. Different species of them from andesine to anorthite, may contain from about five up to twenty per cent. of lime, and the range of those Canadian varieties which have been analyzed by Mr. Hunt, is from seven to about fifteen per cent. The personal exploration which is the subject of the present Report, has shewn, for the first time, that these lime-feldspars occur in this Province, and probably in other regions, in mountain ranges, belonging to a stratified deposit, and not in disseminated or intrusive masses. The breadth of these displayed in the district examined, demonstrates their importance; and the fact that the opalescent variety of labradorite was ascertained by Dr. Bigsby to exist, *in situ*, on an island on the east coast of Lake Huron, while the name of the mineral reminds us of its existence at the

eastern extremity of the Province, sufficiently points out that the lineal range of the lime-feldspars will be co-extensive with Canada. We may therefore anticipate a beneficial result from their influence upon the soils, over the whole breadth of the Province.

The ruins of the crystalline limestone constitute a most fruitful soil, so much so that the lots first cleared in any settled area of the Laurentian country, usually coincide with its range. In these limestones phosphate of lime is sometimes present in great abundance, and there is scarcely ever any large exposure of them examined, in which small crystals of the phosphate are not discernable by the naked eye. Mica and iron pyrites, are present, to furnish other essential ingredients, and the easily disintegrating character of the rock readily permits its reduction to a soil. The effects of these limestones and lime-feldspars are not however confined to the immediate localities in which the beds are found, for boulders of them are met with transported to southern parts, even far on the fossiliferous rocks beyond: and there can be little doubt that their fragments are very generally mixed with the soils of the Laurentian country. Thus while the diversity of minerals in the different rocks of the series furnishes the ingredients required to constitute good soils, the agency of the drift has mingled them, and considering the resistance to disintegration offered by most of the rocks, with the exception of the limestone, the deficiencies that may exist will rather be in the quantity of soil covering the rocks in elevated parts, than its quality where the materials have been accumulated.

Mr. Murray's explorations during the period embraced in these Reports, were carried on principally in the wide and little-known tract of country between the north shore of Lake Huron, east of Spanish river, and the upper part of the Ottawa. Besides a general geological investigation of this district, Mr. Murray has communicated a large amount of important topographical information, illustrated by a series of no less than twenty-two maps of various lakes and rivers, laid down, from his own measurements, on a scale of an inch to the mile. Labors of this kind, unknown to the geological surveyor of old countries, serve to shew the difficulties with which our Canadian survey has still, in great part, to contend. Large districts must be mapped by the explorer, before the results of his explorations can be worked out; and hence, the skill of the practised surveyor has to be combined with that of the geologist proper. It is not every geologist, however, who is capable of responding to this additional demand.

With the exception of a few outlying patches of Lower Silurian strata in the islands of Lake Nipissing, and in the valley of the Bonnechère, the rocks of this district, as determined by Mr. Murray, belong to the Laurentian and Huronian series, overlaid in places by drift clay and sand, with occasional boulders; and traversed at many points by intrusive and intercalated masses of greenstone, and dykes of trap and

compact feldspar. The principal economic minerals of these rocks, comprise crystalline limestone, specular iron ore, magnetic iron ore, workable slates, and quartzites: the white varieties of the latter being apparently available for glass-making purposes. At Iron Island, on Lake Nipissing, the specular iron ore appears in force. "Small masses are common to most of the rock in the island, and in the crystalline limestone there is a very great display of it. For a breadth of about forty yards along the cliff on the east side, the rock holds masses of the ore of various sizes, sometimes running in strings of an inch thick or upwards, and at other times accumulating in huge lumps, some of which probably weigh over half-a-ton. The beach near the outcrop is strewed with masses of all sizes, from great boulders weighing several hundred pounds, to small rounded pebbles not bigger than marbles. The limestone with which the iron ore is associated, is frequently quite cavernous, and the crevices and smaller fissures are thickly lined with crystals of blue fluor-spar and red sulphate of baryta." The following is Mr. Murray's interesting sketch of the general features of Lake Nipissing:

Above the Chaudière Falls, the lower portion of Lake Nipissing takes a general bearing north-east, with an average breadth of from one to two miles, till it expands to the east and west, at the distance of about eight miles into the main body. The west side of this southern arm is deeply indented by a succession of long narrow bays, lying for the most part nearly east and west, and crowds of islands are scattered along the channels and off the shores. From the most southern of these bays, which falls back to the westward for upwards of seven miles, there are two outlets in addition to the one at the Chaudière, the waters of which appear to unite in their course to the southward, and flow in a single stream into the French River, above the Rapide du Pin, falling in a fine cascade of about twenty feet, close to the junction.

The southern shore of the main body of the Lake trends in general very nearly due east and west, forming in the last twenty miles of the west end, the south side of a great western arm, which alternately contracts into narrow straits, in some cases only a few chains wide, and opens again into wide expanses, generally crowded with islands. Measuring from the north-east end of the southern arm to the extreme end of the great western bay, the distance is somewhat over thirty-two miles, and from the extreme east end of the lake to the same place, the total length is a little over fifty-three miles, the western extremity reaching longitude by account 80° 30′ 54″ W. This great western bay was called Bear Bay, and between it and the north-west arm, where the survey terminated in 1854, there are two other large westerly bays, divided by a bold rocky promontory jutting out nearly due east, with a multitude of islands in continuation of the strike, stretching far into the lake. In addition to these main features the whole coast is deeply indented by a succession of marshy bays and coves, separated by bold rocky points, and a number of small streams add their tribute to the waters of the lake.

The general aspect of the western end of Lake Nipissing is bleak and desolate in the extreme. In many parts the coast is entirely bare and barren, and in no instance does the soil afford a better quality of forest timber than a scanty growth of red pine. Vast marshes, overgrown with tall reeds or wild rice, stretch far into the interior, beyond the bays or along the mouths of the tributaries, affording shelter to incredible numbers of wild fowl. Were drainage practicable, these marshes may become available as grass land, but being scarcely at any part above the level of the lake, they are not readily susceptible of artificial improvement.

While the coast presents this wild and desolate appearance, there are many spots not very remote from it where the character of the country is much less forbidding. On the banks of several of the tributaries of this end, all of which are small however, and only accessible to canoes for a short distance, there are good flats of land, in somes cases yielding hard-wood mixed with large-sized white pine; and spots repeatedly occur between the rocky ridges which might be rendered available for the purposes of cultivation. About two miles and a half up a stream which falls in on the south side, near the entrance to the great west bay, the flats extend over a considerable area, and many very large trees of white pine were observed on them, together with maple, elm and birch. Red pine abounds wherever there is soil enough to support a growth at all; and in many parts, especially in the vicinity of the large western bays, it is of good size, straight, and apparently sound.

Like the coast of the main land, the islands for the most part, are rocky, barren and worthless; but this is not without exceptions. As an example, I observed on this occasion, on a second visit to Iron Island, that a large proportion of it, especially towards the southern end, has an excellent soil, yielding a stout growth of maple, basswood, elm and birch, and provided the surface be not too stony, there can be no doubt it is capable of being converted into good farm land. The superior quality of the soil of this island is doubtless due to the calçareous nature of the rock beneath, and this good soil, together with the specular iron ore and its associated fluor-spar, as well as the sandstone and limestone mentioned in last year's Report, seem to indicate the position as one worthy of attention when settlement shall at some future time reach the shores of the lake.

Among the various wild animals which inhabit the country surrounding the lake, I more especially remarked the presence of numerous bears and deer. Reindeer were by no means uncommon, while wild fowl of many descriptions flock in myriads, at certain seasons, to the marshes. The fish of the lake are also very abundant, of unusually large size and excellent quality: the varieties consisting of white fish, maskinongé, pike, bass, pickerel and sturgeon.

As observed in my report of last year, the Indians of Lake Nipissing derive a very considerable profit from the sale of cranberries, which grow in vast quantities on the numerous marshes; but as it is probable that not one-tenth part of the whole area where the fruit abounds is ever visited by the few scattered families inhabiting the country, it appears to me that the produce might be turned to much greater account, and become a tolerably good source of recompense to a settlement. I was informed by an Indian that he and his family, which consisted of his wife and two small children, could easily gather from four to five barrels of cranberries in a day, for which they were paid, on delivery at Shi-bah-ah-nah-ning, at the rate

of $5 the barrel; and that the only difficulty which they had in making the trade a very profitable one, was the small amount their canoes were capable of conveying at a time, together with the shortness of the season previous to the formation of the ice.

The geology and physical characteristics of the Island of Anticosti constitute the subject of Mr. Richardson's Report. The skill with which the structural details of this island—previously all but an unknown land—have been traced out, and the energy shewn by Mr. Richardson in the collection of an almost unparelleled series of fossils in the short space of three months, cannot be too highly praised. Up to the date of this exploration, Anticosti, in geological maps, has been invariably referred to the Niagara group of the Upper Silurians. Its northern portions, however, as shewn by Mr. Richardson's stratigraphical researches, combined with the fossil evidence worked out by Mr. Billings and Professor Hall, belong to the upper part of the Lower Silurian division; whilst its central and southern portions appear to constitute a series of beds of passage between the Lower and the Upper Silurians. Six sets of conformable strata, with a slight dip to the south or south-west, and a general strike, consequently, parallel to the direction or greatest length of the island, have been made out by Mr. Richardson. Beginning at the north shore, the two lower beds, A and B, are referred to the age of the Hudson River group. Even here, however, the transitional character alluded to above, begins to shew itself; as amongst a considerable number of already recognised Hudson River types, with many new forms, we meet with three species previously looked upon as peculiar (in the geology of America) to the Upper Silurian division. One of these, the celebrated chain coral (*Halysites catenulatus*=*Catenipora escharoides*) has hitherto been considered eminently characteristic of the Niagara and Clinton group. It is also in these lower divisions that the curious tree-like fossils, to which Mr. Billings has given the generic name of *Beatricea*, first occur. Of the real nature of these perplexing forms, we are still in ignorance; but they will probably turn out to be corals. The succeeding divisions, passing towards the south or southwest, are denoted respectively by the letters C, D, E, and F. Division F is probably synchronous with the Clinton group, whilst the other divisions represent the Oneida conglomerate and Medina sandstone; but it is proposed to consider them for the present as members of a Middle Silurian series, under the general name of the "Anticosti Group." Respecting the soil and vegetation of Anticosti, and the native denizens of the island and its surrounding waters, we extract the following remarks:

In respect to the soil of the Island, the plains on the south side, as has been stated, are composed of peat, but the general vegetation of the country is supported by a drift composed for the most part of a calcareous clay, and a light grey or brown colored sand. The elements of the soil would lead to the conclusion of its being a good one, but the opinion of most persons, guided by the rules derived from the description of timber which grows on it, would not be favorable, as there is almost a complete absence, as far as my observation went, of the hard-wood trees supposed to be the sure indication of a good settling country.

The most abundant tree is spruce, in size varying from eight to eighteen inches in diameter, and from forty to eighty feet in length. On the north coast, and in some parts of the south, it is found of good size in the woods close by the beach, without any intervening space of stunted growth; the stunted growth was occasionally met with on the north side, but it is only on the tops of cliffs, and other places exposed to the sweep of the heavy coast winds, where spruce, or any other tree on the island is stunted. In these situations there is often times a low, dense, and almost impenetrable barrier of stunted spruce, of from ten to twenty feet across, and rarely exceeding a hundred feet; beyond which open woods and good comparatively large timber prevail.

Pine was observed in the valley of the Salmon River, about four miles inland, where ten or twelve trees that were measured gave from twelve to twenty inches in diameter at the base, with heights varying from sixty to eighty feet. White and yellow birch are common in sizes from a few inches to two feet in diameter at the base, and from twenty to fifty feet high. Balsam-fir was seen, but it was small and not abundant. Tamarack was observed, but it was likewise small and scarce. One of our men, however, who is a hunter on the island, informed me he had seen groves of this timber north from Ellis, or Gamache Bay, of which some of the trees were three feet in diameter, and over a hundred feet in height. Poplar was met with in groves, close to the beach, on the north side of the island.

Of fruit-bearing trees and shrubs, the mountain-ash, or rowan, was the largest; it was most abundant in the interior, but appeared to be of the largest size close on the beach, especially on the north side, where it attains the height of forty feet, with long extending and somewhat slender branches, covered with clusters of fruit. The high cranberry (*Viburnum opulus*) produces a large and juicy fruit, and is abundant. A species of gooseberry bush of from two to three feet high is met with in the woods, but appears to thrive best close to the shingle, on the beach, where strips of two or three yards across and half-a-mile long were occasionnally covered with it; the fruit is very good, and resembles in taste the garden berry; it is smooth and black colored, and about the size of a common marble; the shrub appeared to be very prolific. Red and black currants are likewise abundant; there appear to be two kinds of each, in one of which the berry is smooth, resembling both in taste and appearance that of the garden, the other rough and prickly, with a bitter taste.

Strawberries are found near the beach; in size and flavor they are but little inferior to the garden fruit; they are most abundant among the grass in the openings, and their season is from the middle of July to the end of August. Five or six other kinds of fruit-bearing plants were observed, some of which might be found of value. The low cranberry was seen in one or two places in some abun-

dance, but I was informed that it was less abundant than in many other past seasons. The raspberry was rarely met with.

The most surprising part of the natural vegetation was a species of pea which was found on the beach, and in open spaces in the woods. On the beach the plant, like the ordinary cultivated field-pea, often covered spaces from a quarter of an acre to an acre in extent; the stem and the leaf were large, and the pea sufficiently so to be gathered for use; the straw when required is cut and cured for feed for cattle and horses during the winter.

But little is yet known of the agricultural capabilities of the island; the only attempts at cultivation that have been made are at Gamache Bay, South-west Point, and Heath Point. South-west Point and Heath Point are two of the most exposed places in the Island; and Gamache Bay, though a sheltered position, has a peat soil; the whole three are thus unfavourable.

On the 22nd July potatoes were well advanced, and in healthy condition at Gamache Bay; but a field under hay, consisting of timothy, clover and natural grass, did not show a heavy crop. At South-west Point, Mr. Pope had about three acres of potatoes planted in rows three feet apart; he informed me he expected a yield of 600 bushels, and at the time of my arrival on the 5th of August, the plants were in full blossom, and covered the ground thoroughly; judging from the appearance they seemed the finest patch of potatoes I had ever seen. About half-an-acre of barley was at the time commencing to ripen; it stood about four feet high, with strong stalk and well filled ear. I observed oats in an adjoining patch; these had been late sown, being intended for winter feed for cattle; their appearance indicated a large yield.

Most of the streams and lakes swarm with the finest brook trout and salmon trout, and large shoals of mackerel were almost daily observed all around the island. But in my tour I saw no appearance of schooners employed in fishing, with the exception of one at South Point. The only operations I heard of connected with the trade, were carried on at the mouth of a few of the larger streams on the south side, and at that of Salmon River on the north, by men under Mr. Corbet the lessee of the island, and they were entirely confined to the taking of salmon and salmon trout. Seals were extremely abundant, and but for a few Indians who come over from Mingan in July and August, and take a few of them on the north side of the island, they would be wholly undisturbed. In the bays and more sheltered places round the island these creatures are met with by thousands. It was not uncommon to stumble across one asleep on the beach, when generally it was despatched with a blow or two of our hammers.

Several species of whale were observed to be abundant towards the west end of the island. This must be a favorite resort, as they were either seen or heard at irregular intervals day and night. One of them about sixty feet in length, and about fifteen feet above the water's edge was found grounded on the reef in Prinsta bay when we passed on the 3rd September.

The only fishing schooners I saw, with the exception of the one mentioned, were at the Mingan Islands, where twelve or thirteen came to the harbor for shelter during a storm. I was informed by Mr. Henderson, the gentleman in charge of the Hudson's Bay Company's post at Mingan, that they were all from American ports.

The wild animals met with on the island as far as I am aware, are the common

black bear, the red, the black, and the silver fox, and the marten. Bears are said to be very numerous, and hunters talk of their being met with by dozens at a time; but on my excursion I only observed one at Ellis Bay, two near Cormorant Point, and one in the neighbourhood of Observation Cape. I came upon the last one on a narrow strip of beach at the foot of a high and nearly vertical cliff. Seen from a distance I took the animal for a burnt log, and it was only when within fifty yards of him that I perceived my mistake. He appeared to be too busily engaged in making his morning meal, on the remains of a seal, to pay any attention to me, for although with a view of giving him notice to quit I struck my hammer upon a boulder that was near, and made other noises which I conceived might alarm him, he never raised his head to show that he was aware of my presence, but fed on until he had finished the carcase, obliging me, having no rifle, to remain a looker-on for half-an-hour. When nothing of the seal remained but the bones, the bear climbed in a leisurely way up the face of the naked cliff, which could not be many degrees out of the perpendicular, throwing down as he passed considerable blocks of rock, and disappeared over the summit which was not less than a hundred feet above the sea.

Foxes and martens are very abundant; the marten was frequently heard during the night in the neighbourhood of our camp, and foxes were seen on several occasions. Of the silver grey fox, the skin of which frequently sells for from twenty-five to thirty pounds currency, from four to twelve have been obtained by the hunters every winter. Mr. Corbet, the lessee of the island, employs several men during that season to hunt these animals for their fur, and I understand he makes some profit by the trade.

I heard of no animals of any other description, with the exception of wild fowl; and I saw no frogs nor reptiles of any description, and I was informed by the hunters that there were none.

In the first part of the Report by Mr. Billings, we have a very able analytical review of the palæontological relations of the Anticosti rocks. This is succeeded by detailed descriptions of a great number of newly-determined forms, embracing not only new species, but many new genera. Scattered through these descriptions, we find the germ of much new thought, although so unostentatiously brought forward, as very easily to escape detection on the part of the casual reader. It is only to be regretted, for the sake of our palæontological students, that it was found impossible to give illustrations of the various fossil species here described. This want will be gradually met, however, by the re-publication of the more characteristic forms with ample illustrations, in the series of Memoirs about to be issued by the Geological Commission, on the plan of the well-known Decades of the British Survey. By the kindness of Sir William Logan, we have already seen a few of the lithographed plates recently printed in England for this series, under the personal superintendance of Mr. Billings, and we can speak most highly of their execution.

Following Barrande, McCoy, and other naturalists, Mr. Billings discards the genus *Ormoceras*, and places all the straight forms of the *Orthoceratidæ*, whether with simple or with beaded siphuncles, under the single genus *Orthoceras*. Until the publication of this Report, we confess to have held an opposite view. Our objection to this union was chiefly founded on the following consideration, *viz.*: — that amongst the curved or nautiloidal types, no examples were presented of a departure from the simple or at least the non-inflated form of siphuncle. The nautilus, it is true, has not yet been found to exhibit the beaded siphuncle in any of its species, but Mr. Billings has broken down the objection alluded to above, by citing examples of other curved forms with this character of siphuncle, preserved in the collections of the survey.

The specimens [of the old *Huronia vertebralis* of Stokes, re-named *Orthoceras Canadense* by Mr. Billings] in the collections of the Geological Survey of Canada show a regular transitional series, from those with siphons scarcely at all inflated to those with annulations an inch and a-half in diameter. The segments are also either fusiform, globular, oblate, spheroidal, nummuloid, turbinate, or more swollen at one side of the chamber than at the other. Some of these forms are also apparent in two other genera. Thus in *Gyroceras magnificum* the siphon between the septa is dilated into a series of fusiforms beads; in *Cyrtoceras regulare* the expansions are globular but scarcely two-thirds of a line in diameter; in *Cyrtoceras subturbinatum* globular, four lines in diameter, and exhibiting radiating lamellæ; while in one fragment of a species of *Cyrtoceras*, not described, it is expanded in the upper part of the chamber, and tapering below, exhibits a form very like Huronia.

The curious tree-like fossils, the Beatricea, first discovered by Mr. Richardson, in the Island of Anticosti, and subsequently in the fossiliferous limestone of Lake St. John, north of Quebec, are referred provisionally by Mr. Billings to the vegetable kingdom, but their true nature is still uncertain. The fossils associated with them are opposed to the view of a vegetable origin; unless we look upon them as gigantic fucoids; or as belonging to some extinct marine type of comparatively high organization. Their true place is probably amongst the corals. No description of these curious forms having yet appeared in the *Journal*, we quote the following, as given by Mr. Billings:

Genus Beatricea.

The above generic name is proposed for certain tree-like fossils collected in the Lower and Middle Silurian rocks of Anticosti. They consist of nearly straight stems from one to fourteen inches in diameter, perforated throughout by a cylindrical and nearly central tube, which is transversely septate. Outside of the tube,

they are composed of numerous concentric layers resembling those of an exogenous tree. No traces of roots or branches have been distinctly observed. There appear to be two species, distinguishable only by the characters of the surface.

BEATRICEA NODULOSA.

Description.—The surface of this species is covered with oblong, oval, or subtriangular projections from one to three lines in height, each terminating in a rounded blunt point which is nearer to one end of the prominence than to the other. Some of the projections are six or seven lines in length at the base, and half as wide. Generally they are smaller, and often with a nearly circular base: the distance between them is from one to three lines. They exhibit in some specimens a tendency to an arrangement in rows following the length of the stem. In some instances these rows wind around the stem in spirals. In addition to these characters, the whole surface is fretted with minute points, and these when partially worn show a perforation in their centres.

In a specimen three inches in diameter, the diameter of the central tube is three-quarters of an inch; the transverse septa are thin, very concave, and at distances from each other varying from one line to one inch.

Locality and Formation.—Anticosti, at Wreck Point, Salmon River and Battery Cliff. Lower Silurian.

Collector.—J. Richardson.

BEATRICEA UNDULATA.

Description.—The surface of this species is sulcated longitudinally by short irregular wave-like furrows from two lines to one inch across, according to the size of the specimen. In other respects it appears very like *B. nodulosa.* The largest specimen is ten feet five inches in length, about eight inches in diameter at the large end, and six inches and a-half at the smaller extremity. Another short fragment is fourteen inches in diameter.

All the specimens of both species are replaced by carbonate of lime, but show more or less perfectly the septate character of the central tube and the concentric arrangement of the layers of the stem. They are generally broken up into short pieces.

Locality and Formation.—Cape James, Table Head, two miles east of Gamache Bay, and numerous other localities in the Middle Silurian.

The four Reports contributed by Professor Sterry Hunt, embrace a wide and varied range of investigation. In the Report for 1853, the composition is given of several mineral springs occurring in different parts of the Province; with analyses of the waters of the St. Lawrence and Ottawa rivers; further analyses of the shells of lingulæ and other fossil genera, in which, it will be remembered, Mr. Hunt first made the important discovery of phosphate of lime as the predominating constituent; also, the results of some chemical examinations of limestones and dolomites belonging to the Laurentian series; assays of argentiferous galena from Lake Superior, the Chaudière Rapids, and other places; and some assays of gold from the Rivière

du Loup. Notices of the more important of these topics, as treated by Mr. Hunt, have already appeared in the pages of this Journal.

The second Report is one of much scientific interest. It comprises, in the words of Mr. Hunt, "a series of investigations of the stratified-crystalline or metamorphic rocks of the country, undertaken in the hope that a careful comparative study of their composition, in connection with that of the unaltered sedimentary strata, may lead to the clear understanding of the nature of that metamorphic process whose results are so conspicuous in our Canadian geology." In the prosecution of this inquiry, a considerable number of complex analyses are given, the value of which will become still more apparent, as the subject is more fully developed. The labradorites and triclinic feld-spars of the Laurentian rocks generally, are considered by Mr. Hunt—in accordance with the opinion of Delesse, respecting these so-called species from other localities—to consist of mixtures of Albite and Anorthite in variable proportions. As these minerals, however, including albite and anorthite, agree so closely with one another in crystalline form, we might here adopt the view of one fundamental composition ($= x$ R O, x Al ^{2}O^3, x Si O^3) combined with additional atoms of silica—Si O ^{3}, 2 Si O ^{3}, &c.—according to the species or, more properly, the variety: these additional atoms being held, furthermore, to be without influence on the crystallization of the compound, although necessarily affecting its comportment with chemical reagents. This view is apparently shadowed out, though not exactly stated in this manner, in the fourth edition of Dana's Mineralogy, vol. 2, page 228.

The observations which we give below, on the manufacture of hydraulic mortars with magnesia in place of lime, are extracted from the Report for 1855, in which Mr. Hunt has also published some long and important communications on the Metallurgy of Iron, in explanation of Chenot's Process, the Extraction of Salts from Sea Water, and other subjects of much practical interest:

MAGNESIAN MORTARS.

The attention of several chemists has been of late years turned to the study of cements and mortars, but it is especially to the laborious and admirable researches of M. Vicat of Grenoble, that we are indebted for a complete elucidation of some of the most important questions connected with the subject. The ordinary mortars composed of lime and sand, harden gradually by exposure to the air, and this process depends upon two distinct reactions; first, the absorption of carbonic acid from the air, and the formation of a sub-carbonate of lime, and secondly, upon a partial combination of the lime with the sand, forming a silicate of lime. When

placed under water, however, and excluded from the influence of carbonic acid, mortars thus composed do not harden, but become dissolved or disintegrated; they cannot therefore be employed for constructions which are submerged.

Certain limestones have long been known to yield mortars or cements, which have the property of hardening under water; and pozzuolanas of Italy and some other countries, when mingled with ordinary lime, yield mortars which are possessed of similar properties. Pozzuolanas, and these peculiar limestones are comparatively rare; but Vicat has shown that it is possible to imitate them in a very simple manner, and with materials which are everywhere present, to prepare hydraulic cements. The limestones which yield hydraulic cements are those which are mingled with a certain proportion of clay, and by calcining an artificial mixture of carbonate of lime and clay, we may prepare hydraulic cements, varying in character according to the proportions of the mixture. When the limestone contains 10, 15, or 25 per cent. of clay, it becomes more and more hydraulic, and when the mixture amounts to one-third of the lime, we obtain a mortar which hardens almost immediately in air or under water. The proportion of clay may even rise to 60 per cent.

The name of Roman cement is applied to a mixture of this sort, but incorrectly, as the preparation of such a cement was unknown to the Romans. The *pozzuolana* or *trass*, which was employed by them to give hardness to their mortars, is a felspathic or argillaceous matter, which has been calcined by volcanic heat, and has thus acquired the property of rendering ordinary lime hydraulic. It suffices, in fact, to calcine any ordinary clay, especially with the addition of a little alkali, to obtain an artificial pozzuolana.

The well-known Portland cement (so called because its colour resembles that of the Portland stone,) is prepared by calcining a mixture in proper proportions, of chalk with the clayey mud of the Thames; but similar and equally good cements are now manufactured elsewhere in England and France by mixing chalk or marl with other clays. The materials are reduced to fine powder, and intimately mixed with the addition of water. The resulting paste is moulded into bricks, which are dried and burned. It is of importance that the heat in calcining be sufficiently elevated, otherwise the carbonic acid and water may be expelled without that reaction between the lime and clay which is required for the production of a cement. It is necessary to employ a white heat, which shall agglutinate and frit the mixture. After this operation the material is assorted, and the portions which are scorified by too much heat, as well as those insufficiently calcined, being set aside, the cement is pulverized for use. It is often advantageous to grind to powder the native mixture of limestone and clay before burning them, in order to ensure greater homogeneousness. It will also be seen that a calcination at a very elevated temperature is frequently required to develope the hydraulic character of limestones: the greater the temperature employed, the more slow is the solidification of the cement, but the harder does it become.

The portions of cement which have been over-heated and converted into a slag, as well the semi-vitrified masses obtained in the calcination of ordinary lime, overburned bricks and tiles, and the scoriæ of iron furnaces, may all be used with advantage to give hydraulic properties to ordinary lime, either by mingling with it before burning, or by employing them as pozzuolanas to mix with the slacked

lime. The theory of the solidification of these various cements, and the important part played by the alkali which is always present, in forming a silicate of lime, has been carefully studied by Kuhlmann and Fuchs; the application of soluble glass for the silicatisation of limestones and other calcareous materials, depends upon a similar reaction. But important as is this question, both in a theoretical and practical point of view, I shall reserve it for another occasion.

The cements prepared by the different processes above indicated, leave nothing to be desired for constructions in fresh water, but do not uniformly resist the action of the sea, which causes a great many of these hydraulic cements to lose their cohesion, and eventually fall to pieces when immersed in sea-water. M. Vicat, junior, has found that this change depends upon the action of the magnesian salts of the sea-water upon the lime of the cement, and has proposed a mortar from which lime is excluded, consisting of caustic magnesia mixed with an artificial pozzuolana. For this purpose such materials should be selected as contain no calcareous matter, and he recommends pipe-clay, or the debris of certain felspathic rocks. These when calcined and mixed with 15 or 20 per cent. of magnesia, previously made into a paste with water, yield a cement which hardens after three or four days, either under fresh or salt water, and acquires after some time a great degree of strength.

But important as this discovery of Mr. Vicat promises to be, the high price of magnesia is opposed to the general adoption of this cement to marine constructions. The inventor calculates that if magnesia can be furnished for $30 or $40 the ton, the cement can be economically made use of, and the directors of the salines of the south of France are now endeavoring to manufacture magnesia on a large scale, from the chlorid of magnesium in the bittern of the sea-water. Carbonate of magnesia is abundant in nature, but almost always found united with carbonate of lime, forming a dolomite, and the pure magnesian carbonate has hitherto been a rare mineral. Associated with a little carbonate of iron and some silicious matters, however, it is found in abundance in the Eastern Townships, where it forms beds among the Silurian slates in Sutton and Bolton. Specimens of it from these localities attracted particular attention at the Exhibition at Paris, where the magnesian mortar of Vicat was first brought forward, and the Reporter of the Jury of the 14th class calls particular attention to the value of this mineral as a source of magnesia, and as possibly destined to become an article of export from Canada.

The magnesite from Bolton, where it forms an immense bed, resembles a crystalline limestone, and consists of about 60.0 per cent. of carbonate of magnesia, 9.0 per cent. of carbonate of iron, and 31.0 of quartz in grains, besides small portions of nickel and chrome. Some specimens from Sutton contain more than 80.0 per ct. of carbonate of magnesia. When this mineral is calcined, the carbonic acid is expelled, and there remains a mixture of magnesia with quartz and oxyd of iron. But as these impurities do not interfere with its application to the purposes of a cement, the previously ignited rock, which in the case of that from Bolton will contain 43.0 per cent. of caustic magnesia, may be directly mixed with calcined clay or pozzuolana, to form the magnesian mortar. Although it is not certain that these native carbonates can be economically wrought for exportation, the subject is certainly worthy of the attention of our engineers who are engaged in the construction of docks and piers in the lower ports of the St. Lawrence. At the

same time the application of this mineral as an economical source of pure magnesia and magnesian salts on a large scale, is one worthy of consideration.

In his Report for 1856, Mr. Hunt takes up the composition of the magnesian and other rocks belonging chiefly to the metamorphic region of the Eastern Townships, and to the older metamorphic or Laurentian series of Grenville and the Ottawa. Following these researches, and partly based upon them, the subject of rock-metamorphism then comes under review. Discarding the agency of intense heat, Mr. Hunt seeks for the cause of metamorphism, in the action of alkaline carbonates in solution at a temperature not greatly exceeding that of the boiling point of water; and he brings forward some interesting experiments in support of this opinion. Although strictly, this is but an extension of the views of Bischof and some other inquirers who have preceded our author in these investigations, it cannot be denied that much praise is due to Mr. Hunt for carrying out the inquiry in an original spirit, and contributing in no small degree to render our knowledge of metamorphic action more satisfactory and precise. Bischof, in his investigations, has certainly fallen into an error which we trust Mr. Hunt will cautiously avoid—that of attempting to force all conditions of occurrence into harmony with his peculiar views: an error which has told more or less, in many minds, against the free reception of Bischof's conclusions, even when these conlusions are manifestly exact. Finally, at the close of Mr. Hunt's Report, analyses are given of the curious white traps of Montreal and its vicinity. These we propose to notice in another place.

E. J. C.

The Temple of Serapis at Pozzuoli. By SIR EDMUND WALKER HEAD, Bart. J. B. Nichols & Sons, London, 1858.

To the classic antiquary, the ancient divinity Serapis, and the rites by which he was worshipped, have furnished prolific themes for discussion. The Egyptian divinity was supposed, by some at least of the Greek writers, to be identical with Osiris; by later authors he has been described as the Egyptian Apollo. But so difficult is it to eliminate from Egyptian mythology anything strictly analogous to classic faith and worship, that Serapis has been identified with Zeus or Jupiter, with Pluto, with Æsculapius, and with Pan. But the difficulties grow still more complicated when we study the divinity

in his Serapeia at Memphis or Thebes, where his favoured worship was associated with the rising of the Nile, and the fertilising of its submerged banks; and at Rome or Pozzuoli, where the intruding god had to contend for a time against the orthodoxy of old Pagan Italy. There, however, as elsewhere in all times, the persecuted rites grew in popular estimation; and in B. C. 43 the temple of Serapis reared its marble columns, by decree of the Roman Senate, in the Circus Flaminius, and the worship of the strange God became not only popular but fashionable; if, indeed the ancient Egyptian, and more modern Alexandrian, with the Greek and Roman Serapis, were the same.

But it is not this mythological question which now attracts attention, and beguiles a distinguished scholar to lay aside for a brief period the cares of vice-regal responsibility, for pleasant dalliance with the literary sphyrx. It matters not, for his present purpose:

"Whether Serapis was a deity originally Egyptian, or whether he was a strange god from Sinope thrust into the place of Osiris by Ptolemy Soter. His worship became the prevailing one at Alexandria, and spread from that commercial city to all the countries with which it was connected. When Pausanias wrote, the deity was established in almost every part of Greece. We find him at Rome in the time of Catullus, and we should certainly look for a temple to him at Puteoli, the regular port for which the fleets of Alexandria steered."

At Pozzuoli, or Puteoli, accordingly, the ruins of a temple still remain on the site, where, according to the celebrated inscription now preserved in the Museo Borbonico at Naples, there existed a temble of Serapis in the year of the city, 649, or sixty-two years before the "canonization" of Serapis, and the building of the new temple of Isis and Serapis in the Circus Flaminius at Rome: B. C. 105. To the former temple a peculiar, popular, and scientific interest now attaches. Its ruined columns are discovered to be the *gnomon* of a scientific chronometer of singular value and utility, by means of which the far-reaching chronometry of the geologist finds important elucidation. The "*Lex Parieti faciundo*" of the Museo Borbonico marble has been challenged by critical antiquaries; aparently without good reason. But no sceptical Maffei or Carelli assails the genuineness of the lithodomous perforations by means of which the columns of Pozzuoli are graven with an indisputable record of their alternate submergence and upheaval, and with this, of the successive changes in the relative level of land and sea, within an easily ascertained period.

Sir Charles Lyell, in his "Principles of Geology," after noticing the diverse opinions of Antiquaries as to the date, form, and purpose of the ruined structure at Pozzuoli, remarks:

"It is not for the Geologist to offer an opinion on these topics; and I shall, therefore, designate this valuable relic of antiquity by its generally received name, and proceed to consider the memorials of physical changes inscribed on the three standing columns in most legible characters by the hand of Nature. These pillars, which have been carved each out of a single block of marble, are forty-two feet in height. An horizontal fissure nearly intersects one of the columns; the other two are entire. They are all slightly out of the perpendicular, inclining somewhat to the south-west, that is, towards the sea. Their surface is smooth and uninjured to the height of about twelve feet above their pedestals. Above this is a zone, about nine feet in height, where the marble has been pierced by a species of marine perforating bivalve.—*Lithodomus*, Cuv.* The holes of these animals are pear-shaped, the external opening being minute, and gradually increasing downwards. At the bottom of the cavities, many shells are still found notwithstanding the great numbers that have been taken out by visitors; in many the valves of a species of arca, an animal which conceals itself in small hollows, occur. The perforations are so considerable in depth and size, that they manifest a long-continued abode of the lithodomi in the columns; for, as the inhabitant grows older and increases in size, it bores a large cavity, to correspond with the increasing magnitude of its shell. We must consequently, infer a long-continued immersion of the pillars in sea-water, at a time when the lower part was covered up and protected by strata of tuff and the rubbish of buildings; the highest part, at the same time, projecting above the waters, and being consequently weathered, but not materially injured.

"On the pavement of the temple lie some columns of marble, which are perforated in the same manner in certain parts; one, for example, to the length of eight feet, while, for the length of four feet, it is uninjured. Several of these broken columns are eaten into, not only on the exterior, but on the cross fracture, and, on some of them, other marine animals have fixed themselves. All the granite pillars are untouched by lithodomi. The platform of the temple, which is not perfectly even, is at present (1828) about one foot below high-water mark (for there are small tides in the Bay of Naples); and the sea, which is only one hundred feet distant, soaks through the intervening soil. The upper part of the perforations, then, are at least twenty-three feet above high-water mark; and it is clear that the columns must have continued for a long time in an erect position, immersed in salt water. After remaining for many years submerged, they must have been upraised to the height of about twenty-three feet above the level of the sea."

If we leave the ruins of the ancient temple, and turn our attention to the neighboring coasts, the like evidence of upheaval, depression, and submergence of the land meets the eye. But still the ancient temple has a value of its own, which the cliff of Monte Barbaro and

* *Modiola lithophaga*. Lam. *Mytilus lithophagus*, Linn.

the low terrace of La Starza cannot supply. The rocky cliff, perforated by the *Lithodomi*, tells the same tale of former submergence as the pierced marble columns; but the rock, though inscribed with the same characters, cannot tell all that is revealed by the pillars of the ancient temple of Serapis. It is something of no slight importance to the geologist to ascertain that any great change in the relative levels of sea and land has taken place within the recent human era, and this the temple columns establish at a glance. But if the date of the structure, and the uses of the edifice, can be established, far more accurate approximations may be made to a definite measurement of the period required for such geological phenomena as are there disclosed; and here it is that the scholar and the antiquary come to the aid of the scientific geologist; and from their combined labors truths of great value, and with a mutual relation of peculiar significance, are educed and rendered generally available.

Sir Edmund Head undertakes the solution of three questions, all of an antiquarian character, yet each of them possessing considerable importance in any discussion relating to the geological phenomena exhibited by the ruins of the so called Temple of Serapis at Pozzuoli. These are—

1st. Was it a temple of Serapis?

2nd. What is its proper age?

3rd. Can any light be thrown upon its history, or on the dates of the various changes of level?

To the first of these reference has been already made. Alexandria was the great seat of the worship of Serapis in its later Egyptian form; nor was his worship abolished in that famous commercial capital till the reign of Theodosius the Great,—the effective ally of orthodoxy against the Arian heresy,—when the ancient pagan rites were summarily abolished by Theophilus the archbishop of Alexandria, and the Alexandrian Temple of Serapis was demolished, or converted to the use of Christian devotees. The overthrow of the temple at Pozzuoli followed in like manner. "It served as a fortress when Olympius retreated to it, as the stronghold of paganism during those tumults, which led to the destruction of the temple itself under Theodosius."

Signor Carelli, who denies the sacred character of the ruined edifice, inclines rather to the idea of its having been public baths, but the Æsculapian attributes of Serapis render the bath room pecu-

liarly compatible with the essential requisites or adjuncts of his temple; and on this subject Sir Edmund aduces some valuable evidence:

"At Pozzuoli a building of some sort occupied the centre of the area. Whether, as in Egypt, the image of the god was placed there, or behind the four columns to which the ruin owes its modern celebrity, may be uncertain. The lowness of situation must have deprived our temple of subterranean passages, and the underground arrangements so elaborately provided in the Egyptian model. The possession, however, of a natural hot spring just behind the temple must have made up for many disadvantages. No appendage could be more appropriate for the temple of a god who among his many attributes usurped those of Æsculapius.

"This warm spring, however, suggests another curious question with reference to a passage in Pausanias. After mentioning several cases of fresh springs in the sea, and the hot springs in the channel of the Mæander, Pausanias proceeds as follows:—'Before Dicæarchia of the Tyrseni (Pozzuoli) there is water boiling up in the sea, and for the sake of it an island made with hands, so that not even this water is wasted, but serves people for warm baths.'

"May not this spring be the very one now existing behind the Temple of Serapis?

"Had the hot spring of Pausanias originally discharged itself into the sea, it does not seem likely that it would have been used at all; but if its virtues had been long known to the inhabitants of Pozzuoli, and a gradual encroachment of the sea, or rather a depression of the land, deprived them of the benefit of the baths to which they had become accustomed, what could be more natural than that a small mound or island should be made by hand in the shallow water, in order that the baths might be again available?

"Pausanias does not indeed say that these baths were connected with a temple of Serapis, but this is immaterial.

"On this theory a number of curious questions present themselves.

"Which is the pavement of the building existing at the time of Pausanias? What, relatively to the floor as now seen, was the level of the original building submerged in the sea? Is it represented by the mosaic pavement found five feet below the floor of the temple? If so, it would be important to examine the soil between the two pavements, and to ascertain whether it appears to warrant the supposition that it was a part of a mound constructed artificially."

Here accordingly we perceive that a new element comes in to complicate the question. Not only has the land, with the superimposed temple, been raised and depressed by natural causes, but the hand of man has also been working and counter working with nature: filling in and raising up when she depressed, as now digging down to ascertain her former operations. But on this also the researches of accurate scholarship can throw fresh light. Sir Edmund Head proceeds:

"It should be stated that, according to the general notion, mosaic pavements

were not in common use at Rome before the time of Sylla—that is, about eighty years before Christ; but it does not follow that a mosaic pavement may not have been added after that date to a building existing before it: so that the mosaic pavement in question may have been part of the Temple of Serapis mentioned in the 'Lex Parieti faciundo.' Pausanias lived in the time of Hadrian, as has been already stated, and, according to this view, the submergence of the first baths or temple, must have taken place between the time of Sylla and that date. We cannot, I presume, suppose that a mosaic pavement would be originally laid under water.

"The level below the water of the Mediterranean of the old mosaic pavement must correspond pretty accurately with that of the base of the columns of the submerged 'Temple of the Nymphs' in the neighboring bay. Did this submergence take place at the time of the great eruption of Vesuvius which overwhelmed Pompeii and Herculaneum, A. D. 79?

"Statius was born A. D. 61, and was therefore about nineteen at the time of the eruption of 79. As a native of Naples, he may be presumed to have been conversant with all the phenomena which then took place. His lines on the subject of the destruction of the cities are very striking:

> Hæc ego Chalcidicis ad te, Marcelle, sonabam
> Littoribus, fractas ubi Vesvius egerit iras,
> Æmula Trinacriis volvens incendia flammis.
> Mira fides! credetne virûm ventura propago,
> Cum segetes iterum, et jam hæc deserta virebunt,
> Infra urbes, populosque premi? proavitaque toto
> Rura abiisse mari? necdum letale minari
> Cessat apex——

"The latter part of this passage seems to me to mean "lands tilled by our ancestors (proavita) have disappeared in the body of the sea" (toto mari). The commentator in the Variorum edition (Lugd. Bat. 1671) appears to understand the word "proavita" as referring to the restoration of these districts hereafter 'proavita dicit respectu futuræ posteritatis'—which seems to me absurd. How were posterity to get the lands out of the sea again? Such is not the use of the word when applied to Hector:

> "Pugnantem pro se, proavitaque regna tuentem."
>
> *Ovid. Metamorph*, xiii. 416.

"I infer from the expressions of Statius that considerable tracts of land had been sunk in the sea by some sudden depression of the ground.

"May not this have been the time when the temple of the Nymphs, and the first baths or temple of Serapis, were covered with shallow water? Is it not possible that between this convulsion and the time when Pausanias wrote, the inhabitants of Pozzuoli may have made the island in the sea (χειροποίητον), and have erected on it a second temple—the one of which the ruin still puzzles the geologist?"

Such are some of the ideas—disclosing the graceful union of science and scholarship by which both have been so materially benefitted in modern times,—that reach us, towards the eve of a stormy

session of our Canadian Parliament, from the pen of our Provincial Viceroy, and furnish a welcome example of relaxation amid the cares and responsibilities of Government, thus found among ourselves in the delightful seductions of scientific speculation and literary research.

D. W.

Introduction to Cryptogamic Botany: By the Rev. M. J. BERKELEY, M.A., F.L.S. London : H. Bailliere, 219 Regent-st., 1857.

A publication relating to Cryptogamic Botany, bearing Mr. Berkeley's name, cannot but be received by all students and amateurs of that branch of science with great expectation and deep interest. His profound knowledge, long experience, and discriminating judgment in respect to some of the most difficult sections of the department he has undertaken to illustrate have been abundantly proved; and, whilst there can scarcely be a higher authority than his, or a guidance better fitted to inspire confidence, there is hardly any branch of knowledge in which the want of assistance is more felt, or in which it is more eagerly sought by those who are determined seriously to apply to the subject.

For many years past, few have commenced the attempt to penetrate the mysteries of cryptogamic vegetation without having recourse to a work with a title similar to our author's, by the learned Kurt Sprengel, author of the Historia Rei Herbariæ, and of a valuable edition of the Systema Vegetabilium. When it is stated that the English translation of this work was first published in 1807, the last edition in 1818, we need not wonder, that, though excellent in its time, it has of late years been felt to be out of date and that the supply of something better adapted to the present state of science was an acknowledged *desideratum*. It was one, however, from which a mere compiler would shrink in despair, and to the various requirements of which few of our ablest men could hope to do justice. It will be generally agreed that the work has fallen into good hands, and that we have here "the right man in the right place." In short, wherever there is a cryptogamic student, Mr. Berkeley's book will be eagerly sought after, and those who do not yet possess it will be glad to know something of what they may expect. The first chapter is devoted to the distinction between the subjects of the work and the rest of the vegetable kingdom, and the name proper to be applied

to them. The author recognizes only three grand divisions—Exogens, Endogens, and Cryptogams. He says, in reference to Lindley's system: "I cannot consider Dictyogens (much less Rhizogens and Gymnogens) as a class of *the same importance* with Endogens and Exogens. They are so clearly endogenous, notwithstanding the peculiarities of the venation, or much more of the structure of the stem, that unless every anomaly is to be considered as overthrowing a natural division, we must either be content to leave them in company with their allies, or give up the attempt of natural arrangement altogether." Probably the advocates of the system referred to, do not hold it to be necessary that all classes should be accounted of equal importance; their view is that smaller transition groups are better separated as classes than only set apart as sub-classes of the larger class which they most nearly approach. Few for instance would be satisfied with considering Gymnogens as no more separated from other Exogens than as any one alliance, or even than as one great section is separated from another. Those who do not admit the class, divide exogens into sub-classes of very unequal extent, Angiospermæ and Gymnospermæ. It can hardly be denied that this distinction is real and important. The question is respecting the best mode of expressing it, and we still incline to prefer Dr. Lindley's plan of increasing the number of classes, though some of them be obviously transition groups of smaller extent and less distinctly marked characters than the others. To us Dictyogens seem a good deal more doubtful than Gymnogens, but we like the idea of these transition classes, and accept for the present an arrangement which includes them. Grant that Gymnogens and Rhizogens have a nearer relation to Exogens, Dictyogens to Endogens, and that Acrogens and Thallogens may be connected together as Cryptogams, yet if these divisions must be recognized at all as something more than orders, the simplest way is to adopt them as classes, but without holding the principle that all classes are of equal value any more in the nature of their characters than in their extent. Having defined cryptogams by the joint consideration of their (generally) cellular substance, their growth by superficial development, the absence of organs strictly corresponding with stamens and carpels, though there are sexual organs—the general substitution of bodies resembling spermatozoa for pollen grains, and the absence of a true embryo—he proceeds to justify himself in retaining the familiar name Cryptogams in preference to several which have been proposed, in which

probably most readers will think him successful. The second chapter more fully discusses the characters by which cryptogams are distinguished, specially examining difficult cases; enlarges on the importance and interest of the study, lays down some cautions as to the mode of pursuing it, illustrates the true meaning of analogy, homology, and affinity, attempts to show that there is no near approach to cryptogams in the higher divisions of the vegetable kingdom; and, after setting aside the notion of spontaneous or equivocal generation as equally untenable in respect to the lower and the higher organisms, concludes by dividing all cryptogams into two great sections, regarded by Lindley as classes of the vegetable kingdom—Thallogens and Acrogens. We quote the summary of characters in the first paragraph: "Cellular or more rarely cellular-vascular, flowerless plants, often destitute of stem and foliage, propagated by simple or compound microscopic spores, germinating by means of one or more simple threads, and rarely containing any embryo, sometimes producing a prothallus, which gives rise to secondary spores or young embryonic plants, increasing mostly by additions to the external surface, exhibiting sexual distinctions, diclinous or monoclinous, but never producing true stamens or pistil, and consequently possessing no true pollen, but, on the contrary, impregnated by spermatozoids, either provided with or destitute of slender flagelliform motile appendages," to which we add the concluding paragraph, containing the distinctive characters of THALLOGENS and ACROGENS: "Thallogens—seldom herbaceous or provided with foliaceous appendages; foliaceous appendages, if present destitute of stomata. Spores rarely producing a prothallus; and, if so, giving rise to a second order of spores germinating at definite points. Spermatozoids not spiral. Acrogens—mostly herbaceous, and provided with distinct, often stomatiferous foliaceous appendages. Spores, for the most part, producing a prothallus, or, if not, complicated fruit by means of the impregnation of an embryonic cell. Spermatozoids spiral."

We think it possible that our author may be disposed to go to an extreme in his rejection of all affinity between cryptogams and any of the higher forms of vegetation. He seems to us quite right in insisting on the reality of the distinctions between them, but the different groups must approach more nearly at some points than at others, and the resemblances which bring certain families into relation are as real though not perhaps as important as their differences.

Gymnogens, Endogens, and Acrogens, seem to us well marked classes, the two former among Phænogams, the latter among Cryptogams; but if there be any real resemblance between Palm Cycadaceæ and Ferns indicating an osculant point, we must not be deterred from recognizing this fact by fear of impairing the distinctness of the line of demarcation. But we leave this subject to lay before our readers the passage from Mr. Berkeley's argument on the importance of cryptogamic studies: "Another excellent inducement to the study of cryptogams is the fact that so many of the diseases, both of plants and animals, arise from their presence. The species which affect animals are probably few in number, and for the most part of common kinds, possessing great powers of ubiquity, and therefore able to establish themselves on what, from the very nature of things, cannot be their natural habitat. Though great attention has been paid to the study of such cryptogams as infest man, and other animals, they have seldom been studied by competent persons, possessed of an accurate knowledge of species, much less of a power of appreciating the changes which may take place in the same species, according to varying outward circumstances. Those who have recorded their occurrence, or have given figures illustrative of their aspect and structure, accompanied by distinctive characters, have often been physicians, better versed in anatomy and microscopy than in cryptogamic botany, and often unable to distinguish a mould from an alga. The parasites of the vegetable world are much more numerous, and are clearly autonomous; and, as some of them produce great ravages on those plants which most subserve the use of man, their study is of immense economical value, apart from other less utilitarian considerations. Till these parasites are accurately distinguished from each other, all attempts at remedy must be empirical; and thus, in the case of the diseases which affect the hop, no efficient remedy was even attempted till the nature of the two principal diseases with which the plant is affected, known under a multitude of names, was accurately ascertained."

The remaining portion of the volume is occupied by details respecting particular orders beginning with the lowest Thallogens, and terminating with the ferns, the highest in rank of cryptogamic plants. Instead of at once dividing Thallogens according to Lindley's plan into the Algal, Fungal, and Lichenal alliances, Mr. Berkeley regards the two latter as more closely connected, and judges it necessary, contrary we think to convenience and practical utility, to put

them together under the name MYCETALES. This is a consequence of the theory that all divisions of one name must be of equal value and equally related to each other, a theory altogether at variance with well-known facts. The arrangement of Acrogens is as follows: "Spores or nucules solitary. CHARACEALES, an alliance consisting of the order *Characeæ* alone.

Spores numerous, giving rise to a plant which produces one or more successive sets of fructifying archegonia:—MUSCALES, § 1, without a peristome: (Hepaticæ) orders RICCIACEÆ, sporangia valveless, without elaters: *Marchantiaceæ*, sporangia dependent valvate or bursting irregularly; Spores mixed with elaters: *Jungermanniaceæ*. Sporangia erect, valvate; Spores mixed with elaters.

§ 2. Peristome mostly present, *Musci* [*Bryaceæ*]. Spores numerous, producing a prothallus which bears a single set of Archegonia which yield fructifying plants. FILICALES—*Filices* [*Polypodiaceæ*], sporangia annulate or rarely exannulate and closely crowded: *Ophioglossaceæ*, sporangia exannulate bivalvate: *Equisetaceæ*, sporangia dependent, unilocular, bursting laterally: *Marsiliaceæ*, sporangia multilocular: *Lycopodiaceæ*, sporangia axillary, unilocular." This arrangement seems to us an improvement on any with which we are acquainted. It is not free from difficulties, but it is upon the whole natural, and compares very favorably with rival systems. We cannot but feel surprised that Mr. Berkeley so little appreciates the value of Lindley's mode of nomenclature, which we had expected to see at once accepted by all writers on the subject. In the case of the ferns, for example, he has applied generally, yet not uniformly, the terminations in *aceæ*, which ought to mark leading orders to the sub-families; whilst, in naming the order, he has preferred the old title Filices to one formed on the analogy of other natural orders. Not less objectionable is the practice of speaking of *monopetalous* orders of plants, a term which conveys a false idea, and which all the most accurate writers are abandoning. We recommend the term *synpetalous* as concise and intelligible, and greatly preferable to *gamopetalous*, which was recommended by De Candolle; but the continued use of a term like monopetalous, which expresses a view universally acknowledged to be false, seems to us a serious evil. Taken as a whole, we can hardly speak too highly of Mr. Berkeley's work. It more than fulfils all reasonable expectations, and will prove such a help to the cryptogamic botanist that he will account

its acquisition an era in his studies. The work is copiously illustrated with woodcuts from original sources, and forms one of the most striking volumes of the fine series with which it is connected.

W. H.

Handbook of Zoology, by J. Van der Hœven, &c., &c., in two volumes. Vol. II. Vertebrate animals. Translated from the second Dutch edition: By the Rev. W. Clark, M.D., F.R.S., &c., late Fellow of Trinity College, and Professor of Anatomy in the University of Cambridge.

We gladly announce the completion of this important work. We wish we could more entirely approve of its systematic arrangement; but, whatever may be supposed to be its faults, it offers most valuable aid to the student, and the account given of the general structure and physiology of each tribe, prefixed to an analysis of its families and genera, is precisely the sort of thing which is needed by the general student. Dr. Clark, in faithfully translating, has also, with the aid of the author, carefully improved the work, and it must be accounted a very valuable addition to the stores of scientific information in our vernacular tongue. It is only to be regretted that two such volumes are unavoidably somewhat expensive.

W. H.

Rational Philosophy in History and in System; an Introduction to a Logical and Metaphysical Course.—By Alexander C. Fraser, Professor of Logic and Metaphysics in the University of Edinburgh. Edinburgh: Thomas Constable & Co. Hamilton, Adams & Co., London.

This little tract has not received from the leading British Reviews the attention to which, in our judgment, it is entitled. Any notices of it with which we have met have been of a most general and vague character; leaving on the mind of the reader no distinct impression, except that the reviewers had nothing very particular to say about the work which they were criticising. This, we suspect, is to be explained by the circumstance that the work professes to be merely a provisional substitute for a syllabus or outline of the course which (with special reference to his own students) the author is labouring to mature; for assuredly it is not owing to the work being either common-place or

unseasonable. A reviewer may ordinarily feel himself excused from giving anything more than a passing notice—if even so much—to a provisional substitute for a syllabus of a Professor's lectures; but the present case is somewhat exceptional. Mr. Fraser's tract is the only work hitherto published which contains a concise and faithful sketch of the modern Scottish philosophy. In the scattered notes, indeed, of the late Sir William Hamilton, the leading doctrines presented in the work before us are found; but, though set forth there clearly enough, it is in too fragmentary a manner, and in rather too esoteric language: objections, the former of which at least we hope to see removed when Sir William's lectures, now in course of publication, have been given to the world. Inasmuch, therefore, as the treatise under review supplies an important desideratum in philosophical literature, while it is also possessed of great intrinsic merit, we regard it as worthy of more attention than is usually accorded to works of a like description.

Before adverting more particularly to Professor Fraser's metaphysical system, a word regarding that part of his treatise in which he touches on the history of philosophy. The treatise is entitled, "Rational Philosophy in History and System;" and those who are in the habit of joining in the common outcry against speculative philosophy —that its history is nothing but a record of mutually destructive systems of thought, contrasting in this respect so unfavorably with the various branches of physical science, which, since their origin, have been always steadily progressing—would do well to ponder our author's profound remarks on this subject. He is fully warranted, we conceive, in saying that when success is measured by the highest standard, "no sphere of mental labour can record a longer series of illustrious successes than Rational Philosophy." But let it be understood what the true standard of judgment is. "A discovery, by means of reflection and mental experiment, of the limits of knowledge, is the highest and most universally applicable discovery of all; it is the one through which our intellectual life most strikingly blends with the moral and intellectual part of our nature. *Progress in knowledge is often paradoxically indicated by a diminution in the apparent bulk of what we know.* Whatever helps to work off the dregs of false opinion, and to purify the intellectual mass—whatever deepens our convictions of our infinite ignorance — really adds to, though it sometimes seems to diminish, the rational possessions of man." To one who is able to interpret it aright, the phenomenon, so obtrusive on the surface of

the history of speculation, of a shifting succession of systems, is by no means inconsistent with the idea of real and great progress. If the various metaphysical theories which, to a superficial observer, appear to resemble the wild beasts in the vision of the prophet Daniel, each rising out of the sea to displace its predecessor: if these theories be carefully examined, they will for the most part be found to recognize important, though partial, truths; their mutual antagonism resulting either from the presence of error in all the systems, or from the denial, on the part of one system, of the truth contained in the others. The history of philosophy may consequently be read as a history, not of conflicting but of conspiring systems. As speculation is continued from age to age, what is erroneous in the several partial systems tends to drop away, having no principle of enduring life; while the really valuable elements survive, and are gradually drawn together into a harmonious and beautiful union; giving rise to what Mr. Fraser calls, in contradistinction to the partial or sectarian systems, the true CATHOLIC PHILOSOPHY. Of course, these ideas are not new; but, in the treatise before us, they are presented and illustrated in an unusually felicitous manner.

Professor Fraser is an adherent of the modern Scottish school of philosophy—more briefly, a Hamiltonian; though he does not by any means slavishly follow his illustrious predecessor. It being kept in view that the great problem which rational philosophy seeks to solve, is, "to determine what is meant at bottom by the so-called real existence which appears in innumerable forms, which every human action assumes, and on which life reposes," the following may be taken as a summary of the principal points in Mr. Fraser's metaphysical creed. (*a*). Real existence is ultimately incomprehensible by finite intelligence. Consequently, the grand problem of metaphysics is insoluble. What that real existence is, of which, in some of its phenomena or varying manifestations, we are perpetually conscious, man cannot know, cannot conceive. This doctrine is opposed, on the one hand, to the theories of those who believe that the problem can be positively solved: in other words, that we are capable of attaining to a knowledge of real existence; and, on the other hand, to the scepticism which represents reason as self-contradictory—in which case no conclusion of any kind would be possible; not even the conclusion that the problem is insoluble. (*b*.) Though real existence is ultimately incomprehensible by finite intelligence, certain of its phenomena or varying manifestations may be apprehended in consciousness. For

instance, in every act of sensitive perception, mind and matter, the ego and the non-ego, are phenomenally apprehended together. Only a small part, indeed, of the universe lies within the sphere of our immediate perception, or is actually presented to consciousness; but the phenomena of the universe which are not actually, may be made virtually, present to consciousness; being "brought within the sphere of intelligible belief by means of the representative faculty, and an inductive comparison of instances." (*c*). The phenomena of real existence, actually or virtually present to consciousness, are temporal; that is, of finite duration. "Real existence, when perceived, must be perceived as something which appears on the stream of time; when merely conceived, it must be conceived as something manifested in time." (*d*). Since real existence can thus be apprehended only in some finite and transient manifestation, it might seem at first sight as though we never could have any ground for introducing into a system of metaphysical doctrine anything regarding real existence, non-phenomenal, absolute, infinite. And, indeed, it is true that the infinite cannot be grasped by consciousness, or an intelligible knowledge of it reached by deduction from what consciousness reveals. Yet we cannot but *believe* in the real as something above consciousness. Such faith, far from being irrational, is the only true rationalism; for our intellectual constitution contains among its elements a variety of beliefs, (commonly called transcendental), essentially incomprehensible, yet irresistibly forcing themselves upon the mind; so that "we are impelled to the infinite by faith," while nevertheless "we are repelled from the infinite by thought." (*e*). According to the view just given, the doctrine of insoluble Realism is built (as, in fact, every non-sceptical system of philosophy must at least profess to be) upon a recognition of the validity of the common beliefs of mankind, even when these are, or may be deemed to be, incomprehensible. And Mr. Fraser considers, that, as respects practice, "the spontaneous feelings and tendencies of human nature, regulated by our moral and religious trust" are "an available substitute for an intelligible theory of existence;" (no such theory, in his opinion, being capable of being framed). Here the canon of metaphysical presumption is laid down, viz.: that "a common belief may be presumed to be true until it is disproved." (*f*). If the great aim of speculation be to determine what at bottom is meant by the real existence which every human action assumes; and if, as our author thinks, this problem be insoluble: what purpose, it may be asked, beyond that of exercising and whetting

the intellectual energies, does speculation serve? A two-fold purpose. In the first place, it repels the attacks of scepticism. In Mr. Fraser's opinion, the germs of scepticism—scepticism as to all that ennobles man, or that man holds dear—are latent in every theory which professes to explain existence; and not only so, but it is from the assumption that an intelligible theory of existence can be framed, and from the contradictions in which such an assumption issues, that scepticism in any instance derives its plausibility. If this be so, it is certainly of immense moment that the insolubility of the great problem of metaphysics should be scientifically made out. In the second place, the conviction, formally arrived at after many a weary effort to penetrate the mystery of existence, that we must *believe*, yet never can *comprehend*—that "knowledge" (as our author, in something of the spirit and tone of Pascal, beautifully expresses it) "must hang suspended, on the wings of Faith and Love, over a dark gulf which the line of reason cannot fathom"—this conviction, it is supposed, must exert upon the soul a direct influence of the most salutary kind; particularly in the way of fostering a spirit of humility and reverence.

Such, in brief outline, is Mr. Fraser's system of rational philosophy; and we are constrained to confess, that, with our present convictions, we cannot assent to it. Whether we can produce a better system, is another question. Perhaps, in due time, we may try. But meanwhile, without undertaking the responsibility of expounding and defending a metaphysical theory different from that of our author, we may (especially in view of the matured treatise, of which Mr. Fraser's present production comes forth as the herald) be allowed to indicate some of the points in which we regard his doctrine as unsatisfactory.

The most objectionable—as it is the most obvious—feature in the system, is, that, on Mr. Fraser's principles, we can have no *strict and perfect certainty* that anything real exists, beyond the phenomena of consciousness. The real, as distinguished from its temporal and changing phenomena, is not consciously apprehended. It cannot be conceived or known by the finite mind. We are, no doubt, impelled to exercise faith in its existence—a faith which Mr. Fraser eloquently insists that it would be in the highest degree unphilosophical to give up. Still, when we look into the matter, we find that after all he does not profess to claim for this faith an *absolute validity*, such as characterizes the knowledge which we have of the phenomena of Being. We do not suppose that Mr. Fraser would complain that the statement now made is inaccurate; but lest any of

our readers should imagine that we are doing him injustice, we may observe that in the law of metaphysical presumption, laid down for the criticism of our common beliefs, and of those transcendental beliefs (among the rest), to which Mr. Fraser thinks that our persuasion of the ultimate infinity of the Real is due, it is clearly implied that certainty in the strict and proper sense of the term is not regarded as a necessary character of our common beliefs. Is the validity, for instance, of the causal belief absolute? Mr. Fraser would answer, as Sir W. Hamilton did before him: the belief must be presumed true, until it is disproved. This is a very different thing from saying that the belief is absolutely valid. It seems to us, in fact, to be virtually saying that the belief is *not* absolutely valid. We do not give a very absolute testimony to a man's honesty, when we declare that he must be presumed honest till he is proved a thief. Sir W. Hamilton's fully developed doctrine is, that the primary beliefs of mankind, regarded as testimonies to matters beyond their own subjective reality, are not essentially "above the reach of question." They must be presumed true in the first instance. But their validity may intelligibly and legitimately be made the subject of argument. *It is conceivable that they may be disproved, or at least discredited.* This has never yet been done; and, consequently, the original presumption in their favor is confirmed. Professor Fraser does not enter into detail, like Sir William; but his sentiments here are manifestly the same in the main with those of his distinguished master. On such a view, however, it is apparent that we can have no strict and perfect certainty of anything beyond the transient phenomena of the ego. We may, from a spontaneous impulse, believe in a substantive Self, in a material world, in God; but these beliefs may (conceivably at least) turn out to be unwarrantable. "As philosophy now stands" (the expression is Sir William Hamilton's) they have a claim upon our acceptance; but this very mode of putting the case implies that (conceivably at least) the verdict of metaphysicians, fifty years hence, may be: "as philosophy *now* stands" the validity of the natural beliefs of mankind must be abandoned. We are fully entitled therefore, to say, that, in whatever terms Mr. Fraser may at times speak of the confidence due to our common beliefs, his theory forbids us to exercise an absolutely perfect confidence in them; and, among other consequences of this, compels us to admit, not only that the real, as distinguished from its temporal manifestations, is inconceivable, but also (a widely different thing) that there is no

absolute certainty that any such reality exists; compels us, in a word, to admit, that there is no strict and absolute certainty of the existence of anything, save the fleeting images that follow one another in the glass of consciousness. Now this doctrine we are utterly unable to assent to. If Mr. Fraser, when he publishes his system in its matured and extended form, can bring forward any considerations to remove our dislike to it, we shall weigh them carefully; but in the mean time, we cling to the persuasion that man has something more than a "presumption" of absolute existence. We cannot divest ourselves of the impression that Mr. Fraser's opinion is closely allied to that very scepticism against which he is so anxious to raise a barrier. Instead of the canon of metaphysical presumption, we would lay down the principle, that the truth of the common beliefs of mankind is perfectly and essentially certain; that no one of these beliefs can even be conceived false; and that a question as to their validity cannot be intelligibly raised. We are mistaken, if an examination of our various common beliefs in detail would not bear us out in affirming this principle—a principle, which, if it could indeed be demonstrated to be correct, would be fatal to the most important and distinctive parts of Mr. Fraser's metaphysical theory.

We suspect that it is for want of an investigation into the *nature* of our common beliefs, that the doctrine which Mr. Fraser has laid down respecting their *validity*, and which is the common doctrine of metaphysicians of the Scottish school, has obtained currency. Take, for instance, the causal belief—to which reference has already been made. What is this belief? As far as we can gather, Mr. Fraser looks upon it as a pure inexplicable mental mode—a mode, as Professor Ferrier, of St. Andrews, might say, of the ego *per se*. Were this the case, we should, of course, be shut up to Mr. Fraser's conclusion respecting its validity. A pure mental mode has no essential and necessary connection—as far as we can see—with anything else. Were the causal belief, therefore, a pure mental mode, we could go no further than "presume" the accuracy of its testimony to what is not included in its own subjective existence. Strict certainty, as distinguished from mere presumption, would, on such an hypothesis, be impossible. But, for our part, we do not regard either the causal belief, or any of the other cognitions, beliefs, &c., of the mind, in the light mentioned. On the contrary, our impression is

that a pure mode of the ego—a mode of the ego *per se*—never, in any single instance, is an object of human consciousness.

The principle, that we can apprehend real existence only in certain of its phenomena, includes the familiar idea that neither mind nor matter can be substantively known by us, but that we can know only their qualities. It may seem absurd to shew hesitation regarding what is one of the common places of speculative philosophy; still, we would venture to ask—Is Mr. Fraser sure that he can discriminate the consciousness of quality from the belief of substance? Is he sure—to take the case of external perception—that he can discriminate his consciousness of the qualities of matter, on the one hand, from his belief in that substantive existence, on the other, of which the object apprehended in consciousness is a manifestation? Let it not be fancied that we are looking back in the direction of David Hume, if we say that we doubt whether this discrimination can be intelligibly made. It is impossible, in a few lines, to explain ourselves fully; and, as has been already intimated, the exposition of our own views is not at present the matter in hand. But we may observe, in general, that we regard what is termed the knowledge of quality as, in a certain sense, the knowledge of substance. The term *knowledge* may, no doubt, be defined in a particular manner, and conditions of knowledge laid down, from which the inference at once results, that substance cannot be known. But definitions prove nothing. Whatever may be judged the most fitting language in which to convey the idea intended, what we mean to convey is, that in every act of human consciousness, the real, as substantively existing, is so discovered, that not only are we determined, by a spontaneous faith, which nothing except a positive demonstration of the self-contradictory character of reason could overthrow, to "presume" its existence; but that its existence is necessarily involved in the consciousness realized; is (as we may express it) a factor requisite—not contingently, or in virtue of the arbitrary constitution of the universe, but in the very nature of things—to produce that consciousness.

In speaking of the inductive belief, through which we attain a knowledge of distant material objects, our author says: "Belief in the universe, as a stable and coherent objective system, is an element in our ordinary belief in the universe as something real. . . . . Through this inductive belief, our knowledge of existence, as a system of mutually related objects, is a progressive knowledge; nor, as it seems, is belief in the coherence or consistency of the surround-

ing universe different in kind from our practical faith in its reality as finite." The explanatory foot-note is added: "I do not now discuss the origin of the former belief, or its relation to mental association—one of the minor problems of a past day." Here may we be allowed to ask whether Mr. Fraser means to intimate that the origin of the two beliefs referred to is not the same? We should almost fancy that he does, from his specifying "the former belief" in so marked a way. Let our readers observe what the beliefs are. The one is our belief in the coherence of the universe; the other, our belief in the reality of the universe as finite: not, however, our belief in the reality of the phenomena of matter immediately apprehended in an act of external perception, but (as the context shows) our belief in the reality of material phenomena lying beyond the range of consciousness. Now we hold it to be altogether incontrovertible that the origin of these two beliefs is the same. Yet Mr. Fraser *seems* to deny this. We should have liked if he had told us what he thinks the origin of our belief in the coherence of the universe to be; and, in connection with this, what validity he ascribes to it. We have no hesitation in saying that we do not regard it as a primitive belief, or as possessed of any such absolute validity as (for instance) the causal belief. In itself, the question of the origin of our belief in the coherence of the universe may indeed be, as Mr. Fraser says, a minor question; it is hardly so, however, if we consider the indication which an erroneous solution of it would afford, of radical imperfection in the general philosophical views of any one by whom such a solution was adopted.

The doctrine that real existence is ultimately infinite, is manifestly irreconcileable with the vulgar notion, that body is made up of continuously extended material particles, or ultimate molecules, of finite size. We were anxious to learn exactly what Mr. Fraser's opinion is respecting the extension of body, but have been disappointed to find him extremely reserved on this interesting point. Does he believe that body is extended at all? He appears to say so, though never very explicitly. The most distinct statement on the subject which his treatise contains, as far as we have noticed, is this: "If it be the common feeling of the human mind, in its healthy condition, that an external and *extended*, and not merely the internal or self-conscious world, is actually present to consciousness in external perception, may that common feeling be arbitrarily set aside as irrational? If so, all our common feelings may be worn away by speculative reasoning." This is hardly enough to satisfy our curiosity. On the one hand, if

it be meant that body, in its own absolute nature, is extended, can this be made to harmonise with the principle of the ultimate infinity of the real, even supposing the infinite divisibility of matter to be conceded? On the other hand, when body is spoken of as extended, is the meaning only this—that the phenomena of body, manifested to conciousness, are apprehended in finite space? Then we ask, is the finite extension of body absolutely (a point on which we ourselves express no opinion) denied by Mr. Fraser? We ask also, can he explain (what we confess is in the meantime dark to our minds) in what sense the phenomena of body, as distinguished from body absolutely, are apprehended in finite space?

We do not overlook the fact that the work under review is merely "*an introduction* to a logical and metaphysical course." We shall only add, meanwhile, that we greatly desiderate from Mr. Fraser a fuller criticism than he has given us, of the conceptions which fill so important a place in his metaphysical system—of time (infinite) and duration (finite), with a determination of the relation between them.

It is hardly necessary to notify any intelligent reader that if a considerable part of this paper has been occupied with the statement of objections, we are not therefore to be regarded as passing an unfavorable verdict on the work reviewed. We have already said that we regard the work as possessing merits of a very high order. Had this not been our opinion, we should not have thought it worth our while to be particular in indicating our dissent from the author's main positions. Whether or not the modern Scottish philosophy be founded in truth, is a matter on which there may be difference of sentiment. We take the negative view; but if this judgment is wrong, we are anxious to be convinced that it is so; and we know of no man more fitted, by learning and natural capacity, than Professor Fraser, to correct misconceptions, to remove difficulties, and to pour in upon the system which he advocates, the light necessary to win the adhesion of those who at present are unable to concur with him.

G. P. Y.

SCIENTIFIC AND LITERARY NOTES.

GEOLOGY AND MINERALOGY.

MASTODON REMAINS, MORPETH, CANADA WEST.

A notice of the recent discovery of a large tooth of the Mastodon Ohioticus (?) in the Drift of Morpeth, C. W., has been communicated to us, with a drawing, by Mr. J. W. Keating. Mr. Duck, of Chatham, has also forwarded a notice of the

same, accompanied by drawings, to Dr. Wilson. The tooth was found in drift sand on a limestone ridge, about seven feet beneath the surface of the ground. It is thought that, by a further exploration, other specimens may be brought to light; and we much regret that, being on the point of leaving for England, we are unable to pay a visit to the locality: more especially as this tooth appears to indicate a species of Mastodon not hitherto discovered in North America,—at least, if the drawings forwarded to us be correct. The *Mastodon Ohioticus* Blum. (= *M. maximus*, Cuv.; *giganteus*, auct.), the common North American species, belongs to the sub-genus TRILOPHODON of Falconer, in which the crown-ridges of the teeth do not exceed four in number, and only amount to four, indeed, in the last true molar: the other true molars, and the first milk molar, exhibiting three ridges. In the drawings of the Morpeth specimen, the tooth shows five distinct crown-ridges, thus resembling the last true molar of Falconer's TETRALOPHODON sub-genus. It would be advisable, therefore, to place the tooth in the hands of some competent person, for minute examination.

PERMIAN STRATA IN NORTH AMERICA.

We mentioned in the last number of the Journal (page 261) that Permian strata had recently been discovered in Kansas Territory. In Silliman's Journal for May, an additional notice is given of the occurrence of rocks of the same age in the Guadalupe Mountains of New Orleans. A series of Permian fossils, collected from a white limestone of that locality, one thousand feet or more in thickness, by Dr. G. G. Schumard, were described by his brother, Dr. B. F. Schumard, in a paper read before the Academy of Sciences, at St. Louis, on the 8th of last March.

LARGE BOULDERS.

The gneissoid and other boulders, so abundantly scattered over the drift area of Canada, are not, as a general rule, of very large size. On a recent examination, however, of a supposed outcrop of limestone in the Township of Albion, C. W., lot 24, concession 9, a point on the highest ridge between Lake Ontario and Lake Huron, we found the so-called bed of rock to be merely a large boulder of Black-River Limestone, containing amongst some indistinct fossils, a well-preserved specimen of *Columnaria alveolata*. It was thought that the "rock" might prove to be an outlying patch of the Niagara limestone; but drift clay and sand with boulders of gneiss and limestone, were seen at lower levels in the same hill; and the presence in the stone of the characteristic Black River coral, showed at once its true origin. The face of this boulder, on the slope of the hill in which it is imbedded, has been blasted off; and a considerable quantity of lime has been obtained from it. Mr. Murray, in one of his recently published reports, mentions the occurrence of some very large boulders of sandstone or conglomerate in the drift of Goderich, in Canada West. These, it appears, under the belief that they constituted a portion of the solid strata, have actually been quarried, in one locality, for building purposes. Mr. Murray refers them to the Oriskany Sandstone, or to the Chemung and Portage group. (See Geological Report in 1855, page 133.)

HEMATITE PSEUDOMORPHS.

In a small boulder, consisting of pale red feldspar with numerous grains and rounded crystals of quartz, the writer of these notes detected some small but

very distinct crystals (octahedrons with truncated edges,) of a steel-blue and feebly magnetic substance, which exhibited all the reactions of sesqui-oxide of iron, and yielded a dull red streak. These little crystals must be consequently either *Martite*, or *altered Magnètite*, in all probability the latter. The existence of Martite, indeed, as a truly independeut species, remains yet to be proved. The boulder in which the crystals occur was found on the shore of Bass Lake, near the road between Coldwater and Orillia, in Canada West, and about four miles from the latter village. Unaltered Magnetite in small granular masses, is present in almost all the crystalline boulders so abundant in that part of the country.

PICTET'S PALEONTOLOGIE: TRIARTHRUS BECKII.

In the second volume of the new edition of Traité de Paléontologie, by Prof. Pictet, of Geneva, there occurs a striking example of the inexpediency of giving to rock groups names founded on the mineral characters of these. In the volume in question, it is stated that *Triarthrus Beckii*, the well-known trilobite of our Utica schist, occurs not in the Silurian, but in the Carboniferous formation,—the term bituminous shales, so often applied to the Utica schist, having manifestly been mistaken by Professor Pictet for the bituminous shales of the coal measures. In the fourth volume, published two years after the appearance of the second, the error is repeated. In the second volume (page 492) Prof. Pictet states, "*Le Triarthrus Beckii*, Green, a été trouvé dans un schiste carbonifère des environs d'Utica (etat de New York). C'est, comme je l'ai dit plus haut, la seule espèce de cette famille qui n' appartienne pas à l'èpoque silurienne;" and in the fourth volume (page 601), the genus *Triarthrus* is refered, with *Phillipsia*, to the Carboniferous epoch. As this error does not appear to have been remarked, we venture to notice it in the present place, but with full acknowledgment of the general excellence and undoubted value of Professor Pictet's useful and most beautifully illustrated work.

NEW GEOLOGICAL MAGAZINE.

We have just received the fourth number of a new monthly magazine, "The Geologist," published in London (England), under the editorship of S. Y. Mackie, Esq. The number before us contains a series of interesting articles, by Professor De Koninck, Professor Ansted, and others, written in a sufficiently popular manner to suit the general reader, and afford information to persons commencing the study of Geology. The list of promised contributors to this new scientific magazine, augurs well for the success of the work. An article in the present number, by Professor Buckman, on the application of Geology in coal-seeking, might be read with profit by some of our Canadian coal discoverers. The Geologist is published once a month by Messrs. Reynolds & Co., of 15, Old Broad Street, London, at one shilling per number.

CARL FRIEDRICH PLATTNER.

We notice with great regret in the last number of Silliman's Journal, a record of the death of Professor Plattner, of Freiberg, well known as the first blowpipe analyst of the day, and the author of the celebrated treatise, "Die Probirkunst mit dem Löthrohre," and other valuable works. Plattner died on the 22nd of January. He was born on the 2nd of January, 1800. For same time before his death, we believe, he was severely afflicted. E. J. C.

CHEMISTRY.

ON THE PURIFICATION OF SULPHURIC ACID.

Cameron found as much as one ounce of arsenious acid deposited from eight pounds of oil of vitriol, and in his paper, published in the Chemical Gazette, 1856, he expresses the opinion that such acid could not be rendered sufficiently pure for accurate investigations. It is well known that the best method of freeing sulphuric acid from arsenic is by passing a current of hydrochloric acid through the oil of vitriol heated nearly to boiling. In order to test the practicability of this method in cases where large quantities of arsenic are present, an experiment was made on quantities of sulphuric and arsenious acid in the above proportion, viz. 1 ounce to 8 pounds. A large portion of the arsenious acid remained undissolved, and hence the experiment was performed under the most disadvantageous circumstances. After passing the gas through the heated acid for one hour, it still exhibited traces of arsenic, but after continuing a strong current for half an hour longer, the residual acid was so pure that no trace of arsenic could be detected by Marsh's test. Hence we may conclude, as might have been presumed *a priori*, that this process is available whatever may be the quantity of arsenic present.

ON SOME COMPOUNDS OF PALLADIUM.

Palladio-bichloride of potassinm is usually prepared by gently heating protochloride of palladium with aqua regia, and adding chloride of potassium; or by boiling the palladio-protochloride with aqua regia. A better method is to pass chlorine through a concentrated hot solution of the palladio-protochloride. Almost the whole of the palladium is precipitated in the form of the bichloride compound, and what remains in solution may advantageously be employed in preparing the chloride of palladammonium.

I am not aware of notice having been taken of the remarkable changes of color of the palladio-bichloride of potassium, under the influence of heat. The change is more striking than with red oxide of mercury, the salt becoming black with a very slight increase of temperature, and resuming its scarlet color on cooling. The conversion with the palladio-protochloride does not take place until the temperature has been very considerably raised and the salt fuses; the color then changes to brown.

Cyanide of Palladammonium.—This salt was originally described as ammoniated cyanide. It can be readily obtained by the addition of hydrocyanic acid to an ammoniacal solution of chloride of palladammonium. It falls as a white crystalline powder, which can be crystallised by re-solution, &c. Analysis showed it to be the salt described by Fehling.

Sulphide of Palladammonium.—When dilute hydro-sulphuric acid, or very dilute sulphide of ammonium, is added to a solution of chloride of palladammonium, the precipitate formed is, in the first instant, of a bright red, or orange red color, similar to the sulphide of antimony; it changes very rapidly into brown or brownish black sulphide of palladium. The red precipitate probably contains palladammonium, but is not a permanent compound.

Double Sulphocyanides of Palladium.—Buchton has described the double sulphocyanides of platinum, but I am not aware that the corresponding palladium

compounds have as yet been examined. They may be obtained in the same way as the platinum salts, viz. by digesting the palladio-bichloride of potassium with a solution of the sulphocyanide of potassium. The potassium salt crystallizes in ruby red prisms which can be obtained of considerable size, easily soluble in water and alcohol. By this latter solvent the salt may be freed from the alkalic chloride with which it is apt to crystallise, and from which it is difficult to separate it without loss. The mixed salts are stirred up with alcohol, and the solution rapidly decanted. The salt is anhydrous, melts at a high temperature, and gives off sulphur, bisulphide of carbon, &c. Very slowly oxidized by nitric acid, after long boiling a white substance is produced, free from sulphur, and corresponding apparently to the platinum compound partly examined by Claus.

The deep red solution of the potassium salt gives with

Solution of	sub-oxide of mercury	A black	precipitate.
do	chloride of mercury	No	do
do	acetate of lead	Orange yellow	do
do	nitrate of bismuth	Dirty orange	do
do	sulphate of copper	Brown	do
do	Chloride of cadmium	Orange	do
do	do zinc	do	do
do	sulphate of nichel	Reddish brown	do
do	do manganese	Yellowish brown	do
do	do iron (Fe O)	Reddish brown	do

The ammonium salt could not be obtained by the action of sulphocyanide of ammonium on the palladio-bichloride of ammonium. It and the sodium salt were obtained from their respective sulphates and the potassium compound.

Similar compounds were obtained by using the palladio-protochloride. The potassium compound crystalizes in dark red needles. The composition of these various salts has not yet been determined, owing to the small quantity of palladium in my possession, but there can be little doubt that they correspond exactly to the platinum salts. The formulæ would then be $Pd.\ Rh.^2 + M.Rh.$ and $Pd.\ Rh. + M.\ Rh.$

The potassium salts are converted by ammonia into a salt crystallizing in fine reddish brown needles, soluble in water and alcohol; the same compound can be prepared by acting on the chloride of palladammonium with sulphocyanide of potassium, in the same way as recommended by Buckton for the platinum salt. The compound is the sulphocyanide of palladammonium.

$$N \left.\begin{matrix} H \\ H \\ H \\ Pd \end{matrix}\right\} Rh.$$

The sulphur is oxidized with very great difficulty, even by hydrochloric acid and chlorate of potassa.

Double Salts of Bismuth.—Jacquelain long since described the bismuths, chloride of potassium, $2\ K\ Cl + Bi\ Cl^3 + 5\ H\ O$. Arppe states that by dissolving 1 equivalent of hydrated oxide of bismuth and 2 equivalents of chloride of potassium, in hydrochloric acid, a salt could be obtained of the formula $3\ KCl + Bi\ Cl^3$ and by using the proportions $2\ KCl$ & $3\ Bi^2O^3\ H\ O$, another having the same form but consisting of $2\ KCl + Bi\ Cl^3$

In making some preparations of bismuth I have been unable to obtain these two compounds, the salt crystallizing out was in both cases,—and also when a large excess of potash salt was employed,—only the Jacquelain salt.

	I.	II.	Cal.
Bi	—	—	40.88
Cl	34.76	34.63	34.85
K	15.66	16.13	15.42
HO	8.46	8.36	8.85

The salts separate out first in rhombic tables, but as they increase in size, they assume the form of a rhombic octohedron, with largely extended terminal planes, and two side polars (brachydomes), which is the well known form of Jacquelain's salt.

If the above mixtures be boiled in hydrochloric acid without the addition of any water, a granular salt separates, the formula of which is $2\,K\,Cl + Bi\,Cl^3 + 3\,HO$.

		Cal.
Bi	42.82	42-39
Cl	34.91	36.13
K	15.83	15.97
HO	5.66	5.51
	99.22	100.00

No anhydrous crystallized salt could be obtained by any means.

H. C.

METEOROLOGY.

At the third ordinary meeting of the Canadian Institute, during the past Session, a report was submitted and adopted from the Committee on Meteorology, after a reference to Professor Kingston. the Director of the Magnetic Observatory, We now print, by order of the Council, the Report of the Committee, along with that from the Director of the Observatory. Their publication has been delayed. owing to the absence of Professor Kingston in Europe.

REPORT OF THE METEOROLOGICAL COMMITTEE,

Read before the Canadian Institute, 9th January, 1858,

BY PROFESSOR KINGSTON, M. A.

In the spring of 1856 a Committee was appointed by the Canadian Institute, for the purpose of conferring with Dr. Ryerson, the Chief Superintendent of Education, relative to the system of meteorological observations about to be instituted at the Senior County Grammar Schools in Upper Canada, and to consider the steps necessary for rendering the system complete.

That so long a delay should have occurred in presenting a report demands some explanation.

The object set forth, it should be noticed, in the appointment of the Committee, was not, as some have erroneously supposed, to institute or even to propose the

means of instituting a system of meteorological observation, but simply to consider the steps necessary for rendering complete that about to be instituted by the Board of Education. Now it is clear that any organization effected through the influence of the Canadian Institute, and designed to be supplementary to the system alluded to, should be in harmony with it as regards the hours of observation, forms of registration, and other details, and that if the Institute had successfully attempted to set on foot another system prior to the establishment of that in connection with the Board of Education, there would have been no security for the maintenance of the unity so essential to the success of the undertaking. The simple fact, then, that the proper function of the Committee was to promote the extension of a system which, prior to the present time, was not in existence, will, it is thought, be a sufficient justification of this apparently tardy action.

The arrangements for setting the Grammar School observations in operation are however, it is believed, now complete, a circular to that effect, to the various Boards of Trustees, having been recently issued from the Education Office. Your Committee, therefore, now feel at liberty to state what steps, in their opinion, should be taken towards the promotion of a knowledge of the meteorology of British North America, and what share especially the Institute ought to take in the matter.

The Committee, in doing this, confine themselves to recommending that which they believe likely to issue in practical action, and purposely abstain from suggesting any schemes which, however desirable in the abstract, are at present unattainable.

Systematic observations three times every day involve, there is no doubt, great personal inconvenience. The avocations of most people would render impossible their attendance at the prescribed hours; and of those not thus hindered, many would be reluctant to submit to the necessary restraint. But it is probable that among those who, from various causes, might be prevented from undertaking regular observations three times each day, many intelligent persons might be found who would be willing to lend a helping hand if any task less onerous could be proposed to them.

Now the services of such agents might be rendered available in one or more of the following modes:

1. By observations of temperature with self-registering thermometers, which require attendance but once each day.

2. By recording the depth of rain and snow, a work in which it is not essential that the measurements be made each day at the same hour.

3. By recording once, or twice, or three times daily, the direction of the wind and the general state of the weather.

To such regular observations might be added:

4. The making occasional communications relative to storms and extraordinary phenomena, or to the results of any special investigations which the observer might think fit to undertake.

The collection of meteorological data then would be carried on by observers whom it may be convenient to divide into three classes.

I. Regular observers of the first class, including all who conform to the

instructions issued under the authority of the Board of Education in Upper Canada.

II. Regular observers of the second class, who record either the daily extremes of temperature, the depth of rain and snow, the state of the wind and weather, or any combination of these three.

III. Occasional correspondents.

Now with reference to observers of the first and second class, it is to be remarked, that in order to turn to account observations of temperature so as to deduce the monthly mean values of that element, it is requisite that tables be formed, derived from the hourly observations at some central station. Such tables have been calculated for Toronto, and these it is probable will be applicable to the greater part of Upper Canada, but as regards the reduction of observations in Lower Canada, it will be necessary that hourly observations be taken for two or three years at some eastern station, such for instance as Quebec.

In the furtherance of the objects above indicated, the action that the Institute may take is two-fold. 1st. By procuring the services of observers, and by placing them in communication with the Toronto Observatory. 2nd. By procuring for such observers the requisite instruments and register books.

The procuring observers may be promoted by addressing memorials to the Governments of Canada and other Provinces of British North America; to Departments under Government (especially to the Department of Education in Lower Canada); and to other public bodies. The memorials referred to should be made on the requisition of the Director of the Observatory to the Council of the Institute. Observers, it is thought, might also be obtained by advertisement, and through the influence of individual members of the Institute.

With the view of securing the employment of suitable instruments and uniform registration, the Committee recommend that the Institute be prepared to procure such at a stated price, payable in advance, for any person willing to take part in these observations, and that advertisements be published to that effect.

Through the kindness of the Chief Superintendent of Education of Upper Canada, very excellent instruments may be obtained from the Education Office, as well as the register books and instructions for first class observers. For observers of the second class much simpler forms may be used, of which a supply should be kept for distribution by the Institute.

The Committee think it needless to add any further remarks, as any action of the Institute not already and expressly named, will be made with the concurrence of the Director of the Observatory, in conformity with the recommendations already given.

The above Report having been referred, by the Council of the Canadian Institute, to Professor Kingston, the Director of the Toronto Observatory, the following proposals were submitted by him for their consideration, and are now printed by order of the Council, with a view to their being effectively carried out.

In furtherance of this, the co-operation of all members of the Institute, or others who may be able and willing to aid in any of the objects specified, is earnestly invited.

MAGNETIC OBSERVATORY,
Toronto, 12th January, 1858.

SIR,—With reference to the Report of the Meteorological Committee, lately adopted by the Canadian Institute, wherein it is recommended that the extension of the system of meteorological observation be promoted by their memorializing public departments, on the requisition of the Director of the Observatory, I request that you will submit to the Council the two following proposals:

1. That the Chief Superintendent of Education in Lower Canada be invited to use his influence in obtaining the co-operation of the principal seminaries and monastic establishments, and in placing them in communication with the Toronto Observatory. With a view of securing the employment of trustworthy instruments, it might be desirable to suggest that a supply be kept at the Education Office, and that the aid of the Director of the Toronto Observatory be sought for procuring them.

2. My second proposal relates to the registration of rain, which, if it were carried out on a sufficiently extensive scale, would furnish information very valuable for engineering purposes, as well as in a meteorological point of view. The observations are of a very simple kind, requiring only the measurement by a graduated glass of the number of cubic inches of rain received in the guage, and its entry in the proper column of the register. The measurement is made but once each day, and not necessarily at the same hour. The cost of furnishing each station, including package and carriage, would not exceed $8 in the first instance, with a subsequent annual cost, for postage and register papers, of $2.

One class of persons particularly qualified, from the stationary nature of their occupation, for keeping such records, are the light-house keepers on the Lakes and the Upper and Lower St. Lawrence. As the light-houses are under the control of the Board of Works, the co-operation of that Department might be sought for furthering this object.

With respect to similar records at stations remote from the river, I am not able to name any persons *as a class* whose services could be reckoned on, but I conceive that many individuals might be found willing to take part in this work, and to purchase the guages, &c., at the moderate cost above named, and that it would be desirable to seek their aid by advertisement.

The question how to meet the expense of furnishing guages to the light-houses I leave to the consideration of the Institute.

I have the honor to be, your obedient servant,

G. T. KINGSTON,
Director.

E. A. Meredith, Esq.,
Corresponding Secretary, &c., &c.,
Canadian Institute.

MISCELLANEOUS.

PAUL KANE.

We learn with much pleasure that our talented Canadian Artist, Paul Kane, has effected very satisfactory arrangements with the eminent London publishers, Messrs. Longman & Co., for the issue of a work prepared from his notes, to be entitled: "Rambles of an Artist among the Indian Tribes of British America, during a four years' sojourn in the Hudson's Bay Territory, Oregon, and along the shores of the Pacific." This interesting and truly Canadian work will be illustrated by engravings executed in the highest style of art, from Mr. Kane's finished sketches and oil paintings; and at the present period, when so great an interest has been excited in North Western territories, the Red River Settlement, the Gold regions of Frazer's River, and the colony of Vancouver s Island,—all of which are included in the subjects of Mr. Kane's notes and sketches,—it is not easy to conceive of a more timely publication, or one likely to do more credit to Canada.

ROBERT BROWN.

The greatest botanist of our time, ROBERT BROWN, has paid the debt of nature, and is gone from amongst us. He had reached the highest pinnacle of scientific reputation, and affords one of the most remarkable instances of this result being achieved not by multitude of writings or frequency of appearance before the public, but by the extraordinary value of a few works, and the impression made on all who had intercourse with him of his profound knowledge, wonderful sagacity, accuracy, caution, and philosophic spirit, qualities which were united with singular modesty and a most amiable disposition. He has left his mark on the age, and his name will go down with honor to posterity. He died on the 10th of June, at the age of 85, having retained his faculties in an unusual degree almost to his last hour.

DR. CHARLES MACKAY.

We referred, in a former number, to the cordial reception accorded to Dr. Charles Mackay, during his recent tour through the United States, and quoted the lively poem of "John and Jonathan," which he recited on the occasion of the festive entertainment with which he was greeted at Washington. The following vigorous stanzas may be accepted as the response to that genial poem of our modern Scottish Songster—the "Minstrel of the joyous Present." They were addressed to him, at Boston, when on the eve of his final departure from the American shores; and are from the pen of the American poet, Oliver Wendell Holmes:—

BRITAIN AND AMERICA.

Brave singer of the coming time,
Sweet minstrel of the joyous present,
Crowned with the noblest wreath of rhyme,
The holly-leaf of Ayrshire's peasant.

Good-by! good-by! Our hearts and hands,
  Our lips in honest Saxon phrases,
Cry, God be with him till he stands
  His feet amid his English daisies.

'Tis here we part. For other eyes
  The busy deck, the fluttering streamer,
The dripping arms that plunge and rise,
  The waves in foam, the ship in tremor,
The kerchiefs waving from the pier,
  The cloudy pillar gliding o'er him,
The deep blue desert, lone and drear,
  With heaven above and home before him.

His home! The Western giant smiles,
  And twirls the spotty globe to find it:
"This little speck, the British Isles?
  'Tis but a freckle, never mind it!"
He laughs, and all his prairies roll,
  Each gurgling cataract roars and chuckles,
And ridges, sketched from pole to pole,
  Heave till they shake their iron knuckles.

Then Honor, with his front austere,
  Turned on the sneer a frown defiant,
And Freedom, leaning on her spear,
  Laughed louder than the laughing giant:
"Our islet is a world," she said,
  "Where glory with its dust has blended,
And Britain keeps her noble dead
  Till earth, and seas, and skies are rended!"

Beneath each swinging forest bough
  Some arm as stout in death reposes;
From wave-washed foot to heaven kissed brow,
  Her valor's life-blood runs in roses.
Nay, let our ocean-bosomed West
  Write, smiling in her florid pages:
"One-half her soil has walked the rest
  In poets, heroes, martyrs, sages!"

Hugged in the clinging billows' clasp,
  From seaweed fringe to mountain heather,
The British oak, with rooted grasp,
  Her slender handful holds together.

With cliffs of white and bowers of green,
  And ocean narrowing to caress her,
And hills and threaded streams between—
  Our little Mother Isle, God bless her!

In earth's broad temple, where we stand,
  Fanned by the eastern gales that brought us,
We hold the missal in our hand,
  Bright with the lines our Mother taught us.
Where'er its blazoned page betrays
  The glistening links of gilded fetters,
Behold, the half-turned leaf displays
  Her rubric stained in crimson letters.

Enough. To speed a parting friend,
  'Tis vain alike to speak and listen;
Yet stay—these feeble accents blend
  With rays of light from eyes that glisten.
Good-by! once more. And kindly tell,
  In words of peace, the Young World's story;
And say, besides we love too well
  Our Mother's soil—our Father's glory.

ARCTIC SCENERY.

It can scarcely have failed to suggest itself to every considerate reader of the beautifully illustrated edition of Dr. Kane's Arctic Expedition, that the views owed not a little of their artistic effect to the skill of the New York or Philadelphia draughtsman. We have only to bear in remembrance the sunless winter, spent in a region which nearly precluded exposure to the open air for even a brief period; and then to conceive of the manipulation of a pencil held in a hand gloved and furred till it was as delicate as a polar bear's paw. Any sketches made under such circumstances could, at best, be mere suggestive notes; and from such slight hints we presumed the artists employed by Messrs. Loyd & Co., of Philadelphia, had eliminated their tasteful and showy vignettes. But we were totally unprepared for such a shameless fraud as it is now affirmed—seemingly on indisputable evidence—has been perpetrated; thereby linking the honored name of Dr. Kane, with what the correspondent of one of the New York journals justly characterises as "a piece of literary swindling worthy of the notorious Barnum;" and such as would, in England, stamp the character of any publishing house resorting to such frauds with such a reputation as would effectually arrest its chances of further profitable deception of the public..

"It is well known," says the writer in question, "that Dr. Kane's work on the Arctic Expedition was all the rage a short time ago in American Society. An engraver, named Cyram, has lately sued the publishers, Loyd & Co., of Philadelphia, for the sum of $264, due for engraving plates for Dr. Kane's work. Some amusing facts came out on the trial. It appears that the picture representing the *Advance* stuck in the ice, was copied from an old picture in Captain Cook's

Travels in the South Seas, with ice thrown in *ad libitum.* The portrait purporting to be of Sontag, one of Kane's officers, was altered from a portrait of a highwayman in the *National Police Gazette.* An engraving regresenting the occultation of Saturn, was produced by altering an eclipse of the sun from an old geography. There was more of the same sort. If this is the way Philadelphia publishers bring out the crack books of the season, they deserve to be as world-famous as the Philadelphia lawyers."

ADDISON'S PORTRAIT.

Among the favorite literary Englishmen of the eighteenth century, it might surely be assumed, with unhesitating confidence, that none is better known to us, in all that pertains to his life and social habits, and above all to his external appearance, than Addison. His portrait, engraved and re-engraved, is familiar to all of us; his statue forms one of the fitting ornaments of Poet's Corner, in Westminster Abbey; his features have been commented upon by successive biographers, and brought under review in the graphic essay of Macaulay, as those of a face well-known to all men. Yet it would seem that we have been hoaxed, or hoaxing each other all along. The "Addison" of the portraits and of Poet's Corner is no Addison at all; and the critics are now busy proving that the *Sir Andrew Fountain*, who has been masquerading under the name of Addison, in Westminster Abbey, for half a century, is nevertheless no charlatan, but a very respectable gentleman, thrust in there deservedly enough, though by no deed of his own.

"It is not very long," says one writer, "since the curious incident occurred of a portrait, sold in a private collection, which had long been catalogued as a 'King of Denmark,' being discovered to be an engraved portrait of James II. of England. Within these few days another discovery in portrait-lore has been made which will excite no little surprise, and some regret perhaps, amongst cognoscenti. At Holland House, as we all know, is a portrait long supposed to be that of Addison, which has been prized as one of the gems of the art collection of the noble owner. So highly was it esteemed in this light that when some years ago Mr. Leslie was employed by the late Lord Holland to paint the portraits of his Lordship and Lady Holland, the Addison picture was also included, occupying a prominent position in the foreground. And further, so excellent a likeness was this portrait considered, that when, under the auspices of the late Lord Holland, an agitation was got up which resulted in the production of a statue of Addison for Westminster Abbey, the Holland House portrait was adopted by Sir R. Westmacott, as the authority for his work. Now it happens that this portrait turns out to be no portrait of Addison at all. On a visit recently made to Holland House by Mr. Fountain of Narford, himself a distinguished collector, he identified the picture as a counterpart of a portrait of his ancestor, Sir Andrew Fountain, which had long been in possession of the family. In addition to a portrait, of which the Holland House portrait is probably a copy, Mr. Fountain possesses a miniature repetition of the same original by Zincke, and a full length of Sir Andrew, in his robes, as Lord Chamberlain to Caroline, Queen Consort of George II., and in all these works the likeness is strikingly identical. How the

Holland House portrait became mistaken for one of Addison it would be difficult to explain; but this circumstance may assist in accounting for its being at Holland House at all—Addison and Sir Andrew Fountain were intimate friends, and both friends of Sir Stephen Fox, the founder of the Holland family. Touching the merit of the supposed portrait itself, it is rather singular that Lord Macaulay, in his Essay on Addison, speaks of it in terms of qualified praise, which, after the discovery just made, have a remarkable significance. After looking at the picture he writes,—'The features are pleasing; the complexion is remarkably fair; but in the expression we trace rather the gentleness of his disposition than the force and keenness of his intellect.' Now that the mistake has come to light, it is in the interest of art and literature that it should be made generally known, in order to prevent any further resort by artists or publishers to a mythical portraiture of the great essayist." So says a writer in the *Illustrated London News*. But what of the Addison, *alias* Fountain, of Poet's Corner? It would seem to be curable in the estimation of some, at least, of the critics, by the very simple process of a new inscription, which shall give back to Sir Andrew his own face, and turn the fictitious Joseph out of the Abbey, till his friends and admirers shall see fit to restore him in honest good faith. "Why should not Sir Andrew Fountain be in Westminster Abbey?" writes a Norfolk man to the Athenæum; and all disinterested readers echo, why not? "Sir Andrew Fountain was one of the most distinguished men of his time. Born of an ancient family of the County of Norfolk, he entered the University of Oxford at an early age, where he displayed remarkable talent. He was selected, as the most distinguished scholar of his year, to deliver the Latin oration before William III., who was so pleased with him that he knighted him on the spot. He formed part of the brilliant embassy of Lord Macclesfield to the Electress Sophia, in 1701. He there was a conspicuous ornament of the most brilliant circle in Europe. He became afterwards the constant correspondent of Leibnitz, who frequently consulted him, Sir Andrew Fountain being one of the most learned Anglo-Saxon scholars in Europe. He published a treatise on Anglo-Saxon and Anglo-Danish coins, in Hickes's 'Thesaurus Septentrionalis.' He was intimate with Pope and Addison; and, above all, he was the first *real* friend Swift ever found during his stormy life—the first man who took him by the hand and treated him like a gentleman, and introduced him to his distinguished friends as an equal. Sir Andrew accompanied, in 1707, the accomplished Thomas Lord Pembroke, then Lord Lieutenant, to Ireland, where he found Swift living in comparative obscurity. Sir Andrew introduced him to Lord Pembroke, and they all three became most intimate. They returned together to England in the following year, and Swift then resided with Sir Andrew; and now, for the first time, Swift's talents were appreciated by the great London world. Sir Andrew Fountain was the trusted friend of Caroline, wife of George II.; indeed, so highly did she appreciate his great abilities, that she requested him to superintend the education of her favorite son William." On the death of Sir Isaac Newton, he became Warden of the Mint. Men of less mark, therefore, than the friend of Swift, and Newton's successor in the Mint, have undoubtedly got admission among the Abbey's noble dead; though none of them by so odd a chance of mistaken identity.

D. W.

MONTHLY METEOROLOGICAL REGISTER AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—APRIL, 1858.

Latitude—43 deg. 39.4 min. North. Longitude—79 deg. 21 min. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Average	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Result't. Direction.	Velocity of Wind.					Rain in inches.	Snow in inches.
	6 A.M.	2 P.M.	10 P.M.	Mean.	6 A.M.	2 P.M.	10 P.M.	ME'N		6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.		6 A.M.	2 P.M.	10 P.M.	Re-sult'.	ME'N		
					°	°	°	°	°												°							
1	29.723	29.675	29.684	29.6952	37.8	53.0	43.8	45.78	+ 9.55	.148	.172	.219	.181	.65	.43	.76	.60	N E b E	E	Calm.	N 86 E	6.0	9.0	0.0	3.95	4.25	...	...
2	.712	.638	—	—	34.6	58.1	—	—	—	180	197	—	—	89	39	—	—	Calm.	S	E b S	S 46 E	0.0	4.2	3.0	1.71	2.93	...	...
3	.568	.544	.495	.5300	35.3	55.5	48.0	48.48	+11.47	173	227	182	200	84	51	53	59	N E b N	S E b E	E b N	N 78 E	2.0	3.5	8.4	5.70	6.10	...	...
4	.438	.283	—	—	43.6	59.9	—	—	—	258	268	—	—	91	51	—	—	N E b E	E b N	S W b S	S 23 E	7.5	10.0	7.2	1.86	7.57	0.035	...
5	.415	.313	.524	.4190	39.3	49.8	36.4	42.37	+ 4.65	190	142	110	147	78	38	51	54	S	NW b W	W b N	S 87 W	6.2	23.0	17.8	12.42	14.79	...	...
6	.634	.767	.933	.7925	34.1	34.0	25.9	30.83	— 7.20	111	093	107	103	56	47	76	61	W N W	N W	W N W	N 51 W	16.0	21.6	6.2	13.40	13.85	...	...
7	30.003	.930	.849	.9168	23.8	36.5	29.5	31.07	— 7.35	082	121	099	092	64	55	61	53	W N W	S b W	N N E	S 45 E	3.4	13.2	4.0	0.34	5.36	...	...
8	29.764	.613	.321	.5287	33.5	35.7	38.7	36.73	— 1.98	158	166	214	174	82	79	91	79	E N E	E b N	E b N	N 77 E	12.3	20.2	14.8	16.02	16.06	0.055	...
9	.199	.198	.374	.2708	40.7	56.9	48.0	48.53	+ 9.50	204	236	183	213	80	49	53	63	E N E	W S W	W	S 83 W	4.0	18.2	13.4	9.42	11.49	0.010	...
10	.578	.682	.735	.6732	43.4	46.2	38.3	42.52	+ 3.10	211	151	159	172	74	48	68	63	W b N	N	N b W	N 11 W	9.0	17.2	5.4	7.32	11.70	...	...
11	.775	.706	—	—	35.0	34.6	—	—	—	104	113	—	—	50	56	—	—	E N E	E	E b N	N 76 E	18.3	13.7	4.5	11.84	12.04	...	...
12	.511	.418	.225	.3660	37.2	38.6	38.6	38.03	— 2.10	132	159	189	172	59	68	80	75	E N E	E b N	E b N	N 76 E	22.6	23.4	25.5	22.55	22.57	0.630	...
13	.123	.101	.126	.1170	37.8	41.5	40.0	39.80	— 0.63	218	228	231	229	96	87	94	93	E N E	E b N	Calm.	N 64 E	14.0	8.4	0.0	3.29	4.82	0.135	...
14	.101	.109	.183	.1378	38.6	50.7	44.3	44.42	+ 3.68	215	279	259	254	92	75	89	87	W b S	S b W	S S E	S 12 W	2.2	13.0	2.8	2.29	3.28	0.087	...
15	.234	.282	.356	.2992	40.9	50.5	46.4	45.77	+ 4.72	238	247	213	223	93	67	66	73	S E b S	S W b W	N b W	S 85 W	1.2	14.0	13.8	6.78	10.10	inap.	...
16	.468	.399	.530	.4737	33.5	53.4	38.2	42.27	+ 0.78	161	082	160	129	84	19	69	53	NW b N	W	NW b N	S 86 W	3.4	19.5	6.0	6.32	9.04	...	...
17	.636	.642	.752	.6813	34.4	47.2	34.2	38.65	— 3.07	108	130	131	117	53	40	66	51	NW b N	S b E	Calm.	S 56 W	13.8	8.5	0.0	2.76	5.53	...	...
18	.822	.838	—	—	30.6	46.3	—	—	—	107	141	—	—	63	44	—	—	NW b N	S b E	N N E	N 57 E	0.5	2.3	1.2	2.24	4.46	...	...
19	.933	.893	.710	.8325	41.5	41.5	38.9	40.53	— 1.82	065	118	211	141	24	46	89	56	E N E	E b N	E b N	N 80 E	14.0	10.5	21.4	17.46	17.51	0.075	...
20	.515	.282	.041	.2528	38.9	40.6	41.5	40.38	— 2.40	219	232	249	236	93	92	95	94	E b N	E N E	E b N	N 46 E	18.2	11.8	5.5	6.67	11.88	0.390	...
21	.169	.321	.461	.3353	41.1	50.7	46.2	45.18	+ 2.08	195	185	228	204	76	40	73	68	W N W	W b N	W S W	N 84 W	19.2	19.0	3.0	9.79	10.00	0.015	...
22	.467	.245	.034	.2145	42.2	34.6	52.3	50.45	+ 7.08	226	281	304	270	84	65	77	74	W S W	E b S	S b E	S 20 E	4.0	8.5	4.5	2.38	9.62	0.095	...
23	.281	.483	.532	.4503	44.2	48.0	35.8	40.25	— 8.45	188	120	127	142	64	41	61	56	W	W b N	W b N	N 84 W	21.6	22.0	0.0	15.51	15.56	...	...
24	.545	.544	.707	.6008	32.4	35.8	29.2	32.40	—11.60	138	147	106	128	75	72	66	70	W b N	W b N	W b N	N 79 W	6.2	17.0	7.5	12.51	13.33	...	inap.
25	.768	.789	—	—	29.5	36.8	—	—	—	099	117	—	—	61	53	—	—	W b N	N N W	N W b N	N 34 W	9.5	4.5	3.5	4.83	6.00	...	0.1
26	.865	.856	.858	.8598	30.6	40.4	32.5	35.10	— 9.60	100	131	150	121	58	52	82	60	N b W	S	S	S 1 E	9.8	13.6	2.0	2.96	6.59	...	...
27	.638	.739	.694	.7507	29.6	44.0	37.1	38.40	— 6.62	127	108	115	113	77	38	52	50	N N W	S E b S	NW b N	N 51 W	4.0	8.5	8.9	3.15	8.02	...	...
28	.678	.625	.580	.6237	34.7	50.9	38.6	43.20	— 2.20	145	140	128	148	73	37	54	54	NW b N	S W b S	N N W	N 59 W	12.0	14.0	7.8	6.81	9.19	...	...
29	.558	.412	.206	.3628	36.4	49.1	42.2	43.15	— 2.58	132	149	240	178	61	42	89	64	Calm.	E b S	E N E	N 78 E	0.0	5.8	1.5	2.91	4.08	0.165	...
30	.034	.215	.457	.2527	44.9	61.5	49.0	52.13	+ 6.08	270	326	297	304	90	59	85	78	NW b N	W N W	N W b W	N 43 W	5.0	17.8	7.0	7.31	8.23	inap	...
M	29.5136	29.4015	29.4066	29.4987	37.07	46.44	39.72	41.46	+ 0.47	.168	.175	.184	.176	.73	.54	.73	.66	....	....	....	....	9.86	13.28	7.10	....	9.57	1.642	0.1

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR APRIL, 1858.

Highest Barometer . . . . 30.006 at 8 a.m. on 7th } Monthly range=
Lowest Barometer . . . . 29.011 at midnight on 20th } 0.995 inches.

Self-register-ing Ther.
- Maximum temperature . . . . 65°2 on p. m. of 30th } Monthly range=
- Minimum temperature . . . . 21°8 on a. m. of 7th } 43°4
- Mean maximum temperature . . 48°32 } Mean daily range = 14°16
- Mean minimum temperature . . 34°15 }
- Greatest daily range . . . . 24°8 from p. m. of 2nd to a. m. of 3rd.
- Least daily range . . . . 3.2 from a. m. to p. m. of 6th.

Warmest day . . 30th ... Mean Temperature . . . 52°13 } Difference=21°30.
Coldest day . . . . 6th ... Mean Temperature . . . 30°83 }

Maximum } Solar . . . . 79°8 on p. m. of 30th } Monthly range=
Radiation } Terrestrial . . . . . . 2.8 on a. m. of 7th } 77°0

Aurora observed on 4 nights, viz.: 9th, 10th, 14th and 15th; possible to see Aurora on 17 nights; impossible on 13 nights.

Snowing on 2 days; depth, 0.1 inches; duration of fall 2.5 hours.

Raining on 13 days; depth, 1.642 inches; duration of fall, 80.8 hours.

Mean of cloudiness=0.65; most cloudy hour observed, 2 p. m., mean=0.72: least cloudy hour observed, 10 p. m., mean=0.59.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
2024.02	875.82	2629 79	2911.32

Resultant direction, N 14° W; Resultant Velocity, 1.64 miles per hour.
Mean velocity of the wind 9.57 miles per hour.
Maximum velocity . . . 29.5 miles per hour, from 9 to 10 a. m. on 23rd.
Most windy day . . . . . . 12th—Mean velocity, 22.57 miles per hour.
Least windy day . . . . 2nd—Mean velocity, 2.93 do
Most windy hour, 11 a. m. to noon—Mean velocity, 13.57 do } Difference
Least windy hour, midnight to 1 a. m.—Mean velocity, 6.06 do } 7.51 miles.

1st Frogs croaking loudly during the evening.
2nd—Large and perfect Halo round the sun at 2 p. m.
4th—Distant Thunder at 4 p. m., first of the season.
12th—Very Stormy day; constant Rain, wind high and squally.
13th—Dense Fog from 4 p. m.
14th—Perfect Rainbow at 4 p. m.
24th and 25th—Slight flurries of Snow; very cold days.
29th—Thunderstorm, Lightning and Rain from 7h. 30m. p. m.

Temperature—The mean temperature of April, 1858, was 0°38 above the average of the last 19 years.

Rain—The depth of rain was 0.849 inches less than the average of the same number of years.

Snow—The amount of snow was 2.35 inches less than the average, the depth being almost inappreciable.

Wind—The mean velocity of the wind was 2.28 miles per hour above the average, being the greatest velocity for April during 11 years, with the exception of 1857.

The Resultant Direction and Velocity of the Wind for April, from 1848 to 1857 inclusive, were respectively N 19° W, and 1.90 miles.

COMPARATIVE TABLE FOR APRIL.

YEAR	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Difference from Average.	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant Direction.	Resultant Velocity.	Mean Velocity
1840	42.4°	+ 1.3°	65.9°	25.3°	40.6°	14	3.420	2	...	...	...	...
1841	39.2	— 1.9	62.9	22.1	40.8	3	1.370	3	...	...	...	0.51lbs
1842	43.1	+ 2.0	89.5	21.6	67.9	8	3.740	2	...	...	...	0.57 "
1843	40.9	— 0 2	70.0	15.1	54.9	7	3.185	3	0.1	...	...	0 46 "
1844	47.5	+ 6.4	74.5	17.2	57.3	10	1.515	1	inap.	...	...	0.24 "
1845	42.1	+ 1.0	66.0	14.8	51.2	11	3.290	4	1.5	...	...	1.00 "
1846	44.0	+ 2.9	79.4	24.4	55.0	10	1.300	2	1.3	...	...	0.55 "
1847	39.2	— 1.9	65.6	8.4	57.2	8	2.870	2	4.0	...	...	0.59 "
1848	41.3	+ 0.2	65.4	26.5	38.9	5	1.455	1	0.5	N 77 W	1.46	4.89ms.
1849	39.0	— 2.1	70.9	23.2	47.7	10	2.655	2	1.7	N 43 W	3.14	7.50 "
1850	37.9	— 3.2	63.2	18.2	45.0	7	4.720	2	1.1	N 39 W	1.12	7.64 "
1851	41.3	+ 0.2	59.2	25.8	33.4	11	2.295	3	1.2	N 14 E	2.52	8.07 "
1852	38.2	— 2.9	53.8	19.8	34.0	6	1.990	4	9.4	N 23 E	2.44	6.68 "
1853	41.9	+ 0.8	65.7	27.0	38.7	10	2.625	1	1.0	N 12 W	1.90	5.20 "
1854	41.0	— 0.1	65.1	22.3	42.8	12	2.685	4	2.7	N 53 E	2.44	6.82 "
1855	42.4	+ 1.3	63.8	12.2	51 6	8	2.030	3	1.6	N 36 W	3.99	7.57 "
1856	42.3	+ 1.2	69.8	15.1	54.7	13	2.780	3	0.1	N 29 E	1.64	6.05 "
1857	35.4	— 5.7	51.9	10.0	41.9	10	1.755	11	12 9	N 60 W	4.15	10.24 "
1858	41.5	+ 0.4	61.5	23.8	37.7	13	1.642	2	0.1	N 14 W	1.64	9.57 "
Mean	41.08	...	66.53	19.62	46.91	9.3	2.491	2.9	2.45	...	...	7.29

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST—MAY, 1858.

Latitude—43 *deg.* 39.4 *min. North. Longitude*—5 *h.* 17 *min.* 33 *sec. West. Elevation above Lake Ontario,* 108 *feet.*

Day	Barom. at temp. of 32°. 6 A.M.	2 P.M.	10 P.M.	MEAN	Temp. of the Air. 6 A.M	2 P.M	10PM	ME'N	Mean Temp. +or— of the Average	Tens. of Vapour. 6 A.M	2 P.M	10 P.M	M'N	Humidity of Air. 6 A.M	2 P.M	10 P.M	M'N	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Resultant Direction.	Velocity of Wind. 6 A.M	2 P.M	10PM	Result.	ME'N	Rain in Inches.	Snow in Inches.
1	29.635	29.737	29.884	29.7730	39.8°	50.9°	42.2°	44.72°	—1.70°	.173	.224	.201	.199	.70	.60	.74	.67	N W	S S E	N N W	N 22° W	3.4	8.0	12.8	4.34	6.74	....	...
2	30.105	30.140	—	—	35.0	44.3	—	—	—	.142	.141	—	—	.70	.54	—	—	N	S S E	S	S 77 E	4.7	3 5	1.2	1.52	3.02	....	...
3	30.154	30.048	.904	30.0290	38.4	47.8	44.4	44.30	— 2.75	.141	.058	.132	.110	.61	.17	.44	.39	N E b N	E b N	E N E	N 76 E	2.0	16.0	9.0	11.55	11.63	....	...
4	29.758	29.653	.563	29.6465	45.4	55.2	50.1	50.30	+ 2.88	.235	.272	.250	.253	.77	.62	.69	.69	E N E	E b N	E	N 72 E	9.0	12.5	1.5	6.82	7.09	0.085	...
5	.491	.433	.410	.4387	47.2	56.3	47.6	51.08	+ 3.35	.298	.333	.282	.310	.91	.73	.86	.83	E b N	E	E N E	N 54 E	4.5	9.0	4.4	6.13	7.41	Inap	...
6	.375	.419	.522	.4508	52.3	62.5	54.6	57.15	+ 9.12	.264	.202	.239	.228	.67	.35	.55	.51	N b W	N	N b W	N	12.4	15.0	1.5	8.97	9.19	....	...
7	.637	.634	.646	.6397	53.7	58.4	50.1	55.12	+ 6.70	.202	.255	.241	.227	.48	.52	.67	.53	N b W	S S W	Calm.	S 13 E	5.0	7 4	0.0	1.52	3.31	....	...
8	.665	.592	.496	.5813	45.4	63.5	50.9	53.52	+ 4.73	.253	.254	.271	.266	.83	.42	.72	.66	Calm.	S E	Calm.	S 50 E	0.0	6.0	0.0	2.04	2.54	Inap	...
9	.389	.386	—	—	51.6	66.0	—	—	—	.294	.311	—	—	.77	.48	—	—	Calm.	N W b W	N W b W	N 68 W	0.0	31.1	11.5	10.66	13.16	....	...
10	.679	.661	.625	.6523	37.1	50.1	45.3	44.87	— 4.63	.179	.128	.155	.158	.81	.34	.50	.53	N W b W	S S E	N E	S 84 E	1.2	9.0	3.5	3.48	5.78	0.055	...
11	.455	.203	.040	2135	44.0	44.0	41.3	43.97	— 5.93	.188	.257	.268	.243	.65	.90	.92	.84	E N E	E N E	E N E	N 73 E	21.5	26.0	4.4	15.24	19.63	1.590	...
12	.115	.326	.542	.3532	45.3	48.0	46.0	45.78	— 4.38	.270	.196	.274	234	.89	.58	.88	.76	S W b W	W b N	W N W	N 76 W	9.0	27.2	3.2	11.84	12.07	0.082	...
13	.720	.774	.740	.7475	42.2	57.0	47.8	49.70	— 0.87	.177	.312	.227	.236	.65	.67	.68	.64	N W	S b W	E	N 70 E	10.0	5.5	4.7	1.18	8.16	....	...
14	.687	.569	.473	.5722	45.8	52.0	48.3	48.72	— 2.17	.210	.226	.263	.226	.67	.56	.78	.65	E N E	E N E	N E b E	N 67 E	16.2	14.7	1.4	8.28	9.03	....	...
15	.511	.461	.738	.5910	51.2	63.4	39.3	50.15	— 1.13	.288	.200	.116	.188	.76	.34	.48	.51	N W b N	W S W	N W	N 42 E	6.2	18.5	17.0	12.65	14.40	....	...
16	.896	.842	—	—	39.7	47.2	—	—	—	.100	.160	—	—	.41	.49	—	—	N W	S b W	Calm.	S 8 W	1.4	13.1	0.0	2.69	5.80	....	...
17	.665	.462	.427	.5060	43.6	39.7	41.5	40.92	—11.07	.189	.231	.220	.217	.66	.95	.84	.85	E N E	E N E	N E	N 69 E	11.6	18.8	3.2	11.37	11.97	0.540	...
18	.500	.622	.709	.6228	41.8	49.4	41.1	44.28	— 8.00	.253	.220	.227	.232	.96	.62	.87	.80	S W b W	W N W	Calm.	N 65 W	3.4	14.8	0.0	6.51	6.69	....	...
19	.714	.641	.566	.6273	44.9	50.7	45.2	47.33	— 5.28	.182	.155	.239	.208	.60	.42	.79	.64	N W	S	N W b N	N 15 W	5.0	1.2	9.2	3.30	6.53	0.010	...
20	.504	.531	.613	.5517	41.8	49.4	42.9	45.52	— 7.50	.226	.269	.244	.241	.85	.76	.88	.79	N b E	S W b S	W	N 65 W	4.8	13.5	11.0	10.13	10.67	0.040	...
21	.662	.679	769	.7047	42.4	51.6	42.6	46.28	— 7.03	.157	.162	.271	.170	.57	.42	.62	.54	W	N N W	N W b N	N 49 W	9.4	16.5	9.5	13.08	13 55	Inap	...
22	.886	.873	.814	.8373	43.6	53.4	48.9	49.15	— 4.55	.175	.259	.199	218	.61	.62	.56	.61	N N W	S	S	S 5 W	7.0	7.9	9.0	3.62	5.60	....	...
23	.733	.439	—	—	47.6	48.7	—	—	—	.224	.260	—	—	.66	.76	—	—	S	E N E	E N E	N 46 W	2.7	4.2	1.5	1.84	8.29	0.160	...
24	.303	.401	.457	.3993	51.9	58.6	56.8	55.63	+ 1.35	.289	.330	.319	.309	.75	.67	.69	.70	N W	S S W	E N E	N 31 W	16.8	11.2	2.9	3.46	7.81	....	...
25	.507	.463	.373	.4423	50.5	51.9	49.6	50.78	— 3.90	.256	.255	.329	277	.69	.64	.92	.76	E N E	E b N	E b N	N 76 E	10.2	14.8	19.0	18.18	18.19	1.050	...
26	.271	.328	.381	.3310	46.2	45.8	44.3	45.38	— 9.60	.283	.287	.278	.282	.90	.93	.96	93	E b N	E N E	E N E	N 67 E	20.8	13.2	9.6	13.18	13.15	1.190	...
27	.493	.662	710	.6348	45.1	52.1	50.9	49.15	— 6.13	.276	.270	286	.281	.92	.70	.76	.81	E N E	E b N	N E	N 70 E	11.4	11.6	4.2	10.00	10.06	Inap	...
28	.797	.807	.746	.7800	47.4	56.3	48.7	50.70	— 4.95	.280	.240	.250	.257	.86	.53	.73	.70	E N E	E b N	E b N	N 63 E	8.2	17.0	5.5	11.31	11.46	....	...
29	.710	.611	.597	.6325	50.9	53.4	40.8	50.10	— 5.85	.250	.219	.207	.255	.67	.58	82	.71	E	E b N	S E b E	E	11.2	20.0	8.4	11.08	11.37	0.310	...
30	.614	.639	—	—	46.9	56.6	—	—	—	.300	.306	—	—	.93	.80	—	—	E	E N E	E b N	N 79 E	3.6	6.2	9.0	6.99	7.10	0.100	...
31	.418	.254	.571	.4200	54.5	64.7	52.7	56.77	+ 0.22	.395	.401	.309	.369	.92	.80	.77	.83	S E b E	W S W	Calm.	S 21 W	6.2	9.6	0.0	2.65	7.01	0.150	...
M	29.5808	29.5700	29.5893	29.5838	45.86	53.31	47.15	48.90	— 2.58	.234	.243	.242	.230	.74	.50	.74	.69	....	....	....	....	7.70	13.00	5.75	......	9.30	0.807	...

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR MAY.

Highest Barometer........................ 30.198 at 8 a. m., on 3rd } Monthly range=
Lowest Barometer .... 29.032 at midn't on 11th } 1.166

Self-registr'ing Thermom.
Maximum Temperature............ 69°.8 on p. m.. of 9th } Monthly range=
Minimum Temperature............ 31°.0 on a. m., of 16th } 38°.8
Mean maximum Temperature .... 55°74 } Mean daily range=
Mean minimum Temperature .... 41°68 } 14°.06
Greatest daily range .... 25°.0 from a. m. to p. m. of 23rd.
Least daily range.................. 2°.7 from a. m. to p. m. of 26th.

Warmest day......... 6th ... Mean temperature......... 57.15 } Difference = 16°23.
Coldest day........... 17th ... Mean temperature......... 40°92 }

Maximum { Solar................................ 83° 5 on p. m. of 31st, } Monthly range=
Radiation. { Terrestrial........................ 12°.8 on a. m. of 10th. } 70°7

Aurora observed on 5 nights, viz., on 1st, 7th, 8th, 9th and 21st.
Possible to see Aurora on 17 nights; impossible on 14 nights.

Snowing on days,—depth inches; duration of fall hours.
Raining on 17 days,—depth 6.367 inches; duration of fall 103.2 hours.

Mean of cloudiness = 0.69.
Most cloudy hour observed, 4 p. m., mean = 0.83; least cloudy hour observed midnight, mean, =0.51.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
2579.67	749.12	3519.84	1847.84

Resultant direction N. 42° E.; Resultant Velocity 3.33 miles per hour.
Mean velocity........................... 9.30 miles per hour.
Maximum velocity .... 32.6 miles from 2 to 3 p. m., on 9th.

Most windy day....................... 11th...Mean velocity 19.63 miles per hour.
Least windy day .... 8th...Mean velocity 2.54 ditto.
Most windy hour ... 2 to 3 p.m...............Mean velocity 13.33 ditto. } Difference
Least windy hour ... 9 to 10 p. m...........Mean velocity 5.86 ditto. } 7.47 miles.

Solar Haloes.—Solar Halo and bright Parhelia on 3rd at 7 a. m. Halo on 7th at 2 p. m., imperfect. Halo and distinct Parhelia on 10th at 5 p. m. Halo on 19th at 3.30 p. m. Halo and Parhelia on 30th at 4.30 p. m.

Lunar Halo on 22nd at 8.30 p. m. Very perfect and brilliant Paraselene, exhibiting prismatic colours, at 2 a. m. on 23rd.

Hoar Frost on the mornings of 1st, 10th, 13th, 19th, and 21st.

Ice on the Pools on 2nd at 6 a. m., and 16th at 6 a. m.
Thunderstorms on 17th, 7 to 9 a. m., and 31st, 3 to 5 a. m.
Sheet Lightning on 14th, 10 p. m. to midnight.
Dense Fog on 18th at 6 a. m., and 30th 6 to 9 a. m.
Heavy Dew noted on the mornings of 6th, 8th, and 23rd.
The Resultant Direction of Velocity of the Wind for the month of May, from 1848 to 1858 inclusive, were, respectively, N. 3° W. and 1.42 miles.

COMPARATIVE TABLE FOR MAY.

Year.	Temperature.					Rain.		Snow.		Wind.		
	M'n.	Diff. from Aver.	Max. ob'd.	Min. ob'd.	Range.	No. of days.	Inch's.	No. of days.	Inch's.	Resultant. Direction.	Resultant. V'y.	Mean Force or Velocity.
1840	53.8	+2.[illegible]	74.5	30.8	43.7	9	4.150	...	Not rec'ded	...	...	....
1841	50.5	—0.7	76.2	26.6	49.6	11	2.350	1	Not rec'ded	...	...	0.35 lbs.
1842	49.1	—2.1	74.3	30.0	44.3	7	1.275	...	Not rec'ded	...	...	0.53
1843	49.1	—2.1	79.9	28.9	50.7	5	1.570	...	...	...	...	0.52
1844	53.6	+2.4	77.7	29.0	48.7	14	5.670	...	...	...	...	0.30
1845	49.6	—1.[illegible]	76.6	29.4	47.2	8	2.300	...	...	...	...	0.55
1846	55.5	+4.[illegible]	78.1	34.3	43.8	9	4.375	...	...	...	...	0.46
1847	54.4	+3.2	72.5	27.8	44.7	12	2.040	...	...	...	...	0.29
1848	54.1	+2.9	78.5	31.9	46.6	13	2.520	...	...	N 40° W	1.31	4.93 mls.
1849	48.0	—3.2	72.5	32.7	39.8	16	5.115	...	...	N 51° E	1.97	5.33
1850	47.6	—3.[illegible]	76.3	31 1	45.2	7	0.545	1	Inap.	N 64° W	2.05	6.32
1851	51.3	+0.1	73.2	28.7	44.5	12	2.950	1	0.5	N 32° W	1.59	6.34
1852	51.4	+0.2	73.3	34.5	38.8	7	1.125	1	Inap.	S 82° W	0.99	4.00
1853	50.9	—0.3	78.4	38.4	40.0	17	4.420	1	Inap.	N 20° W	0.93	5.14
1854	52.2	+1.0	[illegible]9.0	27.6	41.4	11	4.630	...	...	S 66° E	0.26	5.38
1855	53.1	+1.9	74.8	33.9	40.9	6	2.565	2	0.9	N 1° W	2.76	5.93
1856	50.5	—0.7	[illegible]0.1	35.5	44.6	14	4.580	1	Inap.	N 4° E	3.99	9.81
1857	48.9	—2.[illegible]	72.5	27.9	44.6	15	4.145	1	Inap.	N 23° W	1.14	8.13
1858	48.9	—2.3	[illegible]6.0	25.0	31.0	17	6.367	...	...	N 42° E	3.33	9.30
M	51.18	...	74.95	31.26	43.08	11.1	3.300	0.5	0.09	...	...	6.42 Mls.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—APRIL, 1858.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL. D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32° Fahr. 6 A.M.	2 P.M.	10 P.M.	Temp. of the Air. 6 A. M.	2 P. M.	10 P. M.	Tension of Vapor. 6 A.M.	2 P.M.	10 P.M.	Humidity of Air. 6 A.M.	2 P.M.	10 PM	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Velocity in miles per hour. 6 A.M.	2 P.M.	10 PM	Mean direction of Wind.	Rain in Inches.	Snow in Inches.	WEATHER, &c. A cloudy sky is represented by 10; A cloudless sky by 0. 6 A.M.	2 P.M.	10 P.M.
1	30.060	29.950	29.961	28.4	50.9	40.0	.117	.302	.188	.76	.82	.77	E N E	NE b E	E N E	1.75	0.57	2.68	...	...	...	Clear.	Clear.	Clear.
2	29.916	.811	.76	37.0	60.2	46.2	.199	.283	.238	.90	.54	.77	S E	SW	S S W	0.00	0.00	0.00	...	...	...	Cum. Str. 10	Do.	Do.
3	.770	.771	.724	41.6	60.1	37.0	.212	.310	.178	.82	.60	.81	SW b S	E b N	E by N	0.00	0.00	0.00	...	...	...	Do. 10.	Do.	Do. Aur. Bor.
4	.828	.718	.65	32.0	48.9	46.7	.143	.212	.262	.79	.74	.84	NE b E	S E b E	S E	0.00	0.00	0.00	...	...	...	Clear.	C. C. Str. 40.	Str. 4.
5	.714	.657	.579	43.6	55.5	46.7	.231	.315	.286	.83	.71	.92	S S E	S E	S b E	0.00	0.00	0.00	...	Inp.	...	Nimb. 10.	Do. 6.	Cum. St. 10.
6	.710	.726	93.	33.4	42.6	25.5	.175	.134	.106	.94	.50	.74	W S W	W b N	W N W	0.00	20.10	21.30	...	...	...	Clear.	C. Str. 4.	Clear.
7	30.073	.929	30.061	16.0	34.8	30.2	.059	.138	.130	.65	.71	.78	W N W	W S W	W N W	21.30	14.90	16.25	...	...	...	Do.	Clear.	Do.
8	.120	30.155	29.925	21.1	48.0	34.0	.080	.236	.162	.71	.70	.83	N E	S E	NE b E	1.47	0.85	0.45	...	...	...	Do.	Str. 4.	C. St. 8. Au. Bor.
9	29.650	29.549	.510	28.4	31.5	30.6	117	168	.161	.76	.95	.95	NE b E	N E b E	N b E	8.82	15.21	9.62	...	0.578	...	Nimb 10.	Nimb. 10.	C. St. 10.
10	.674	.868	.950	28.4	37.9	34.3	.135	.171	.135	.88	.76	.79	NE b E	N W	N W	0.86	2.73	0.52	...	Inp.	...	C. Str. 10.	C. St. 4.	Clear. Aur. Bor.
11	29.997	.961	.970	24.4	42.3	35.0	.083	.177	.162	.66	.66	.80	N b W	N N W	N N E	8.77	8.23	6.27	...	...	...	Clear.	Clear.	Clear. Aur. Bor.
12	.874	.850	.729	29.6	47.9	39.0	.105	.212	.188	.66	.62	77	N E	E S E	NE b E	4.00	3.31	2.14	...	...	...	Do.	C. C. Str. 6.	Cir. St. 9. A. Bor.
13	.508	.461	.467	37.2	43.0	40.3	.178	.261	.241	.81	.96	.98	NE b E	N E b E	NE b E	10.37	6.85	6.52	...	0.600	...	C. Str. 10.	Nimb 10.	Nimb. 10.
14	.332	.256	.364	38.1	43.5	41.5	.229	.271	.251	.90	.96	.96	NE b E	N	W S W	2.90	5.52	0.00	...	Inp.	...	Do. 10.	C. Str. 10.	Cir. St. 10.
15	.327	.378	.476	36.9	47.0	44.3	.207	.249	.282	.98	.77	.97	S S E	W S W	SW b S	0.20	10.41	5.61	...	...	...	Do. 10.	C. C. St. 6.	Nimb. 10.
16	.570	.614	.635	38.1	56.1	37.0	.208	.308	.184	.92	.69	.85	S W	S S W	W S W	4.86	11.22	7.42	...	0.040	...	St. 2	C. St. 8.	Clear. Aur. Bor.
17	.720	.714	.836	33.4	42.2	33.0	.162	.134	.160	.84	.50	.80	W S W	W	W S W	7 80	15.90	8.97	...	...	...	Clear.	Do. 4.	Do.
18	.900	.929	.070	20.0	48.7	37.0	.093	.120	.116	.59	.36	.53	N N W	N W	N N W	0.02	7.02	9.43	...	...	...	Do.	Clear.	Do.
19	.203	.175	.104	29.5	53.0	37.7	.129	.136	.171	.80	.35	.76	N N E	N b E	S by E	0.88	1.01	1.33	...	...	...	Do.	Do.	Light Cir. Lunar [Halo.
20	.045	.793	.635	33.5	50.6	36.2	.175	.186	.170	.94	.51	.80	E	SE b E	S E	0.48	7.97	7.52	...	0.253	...	C. St. 8.	C. St. 10.	Rain.
21	29.283	.423	.615	33.5	42.6	36.1	.162	.177	.170	.84	.66	.80	E by S	E b N	SW b S	6.45	0.80	0.02	...	0.310	2.80	Snow.	Do. 10.	C. St. 10.
22	.730	.686	.548	34.0	51.5	45.0	.182	.289	.251	.95	.76	.84	SE b S	SE b S	S b W	0.02	1.98	3.27	...	...	...	C. St. 2.	Do. 10.	Clear.
23	.501	.498	.581	45.0	50.6	44.1	.182	.258	.218	.61	.71	.76	S W	W	W N W	10.96	18.13	8.93	...	0.263	...	C. C. St. 8.	Nimb. 10.	C. St. 10.
24	.603	.592	.766	34.5	35.5	32.0	.155	.177	.086	.79	.85	.40	W	S W	SW b W	3.20	8.63	19.36	...	...	...	C. St. 6.	C. C. St. 6.	Clear.
25	.875	.900	30.006	30.0	36.1	31.0	.154	.149	.142	.94	.71	.84	W N W	W	S b W	3.62	4.00	3.75	...	...	...	Do. 10.	C. St. 6.	Do.
26	30.006	29.934	30.031	29.0	41.9	35.3	.105	169	.177	.66	.65	.85	NE b E	S W	S S W	0.51	1.02	0.32	...	...	...	Clear.	Do. 10.	C. St. 8.
27	29.912	.847	29.862	30.0	55.0	39.1	.130	.157	.131	.78	.38	.55	W	SE b S	N b E	0.31	0.42	0.57	...	...	...	Do.	C. C. St. 8.	Cir. Cum. 6.
28	.624	.510	.648	34.5	49.0	34.5	.138	.086	.142	.71	.24	.70	N W	W N W	W	10.82	8.10	16.28	...	...	...	C. St. 10.	C. St. 10.	Clear.
29	.690	.562	.541	36.0	57.3	47.5	.170	.142	.249	80	.30	.77	W	W b N	S b W	9.48	32.02	6.16	...	...	...	Clear.	Clear.	C. St. 6.
30	.829	.286	.556	39.9	43.5	43.8	.188	.271	.209	.77	.96	.90	NE b E	E b E	S S E	7.08	8.05	1.90	...	0.803	...	C. St. 10.	Nimb. 10.	Do. 10.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—MAY, 1858.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL.D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32°			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind.	Rain in Inches.	Snow in Inches.	Weather, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	10 P.M.	2 P.M.	6 A.M.	2 P.M.	10 PM	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 PM				6 A.M.	2 P.M.	10 P.M.
1	29.762	29.877	30.065	41.0	54.2	41.1	.190	.206	.169	.74	.49	.65	NW b N	W b N	NW b W	5.37	4.22	6.70	...	...	...	Clear.	Cum. 2.	St. 2.
2	30.316	30.265	.306	34.1	49.6	39.0	.162	175	.13	.80	.50	.55	NW b W	N W	N b W	5.20	0.51	1.47	...	...	...	Do.	Do. 1.	Clear.
3	.404	.202	.194	29.0	57.3	42.5	.136	.242	.215	.83	.52	.79	W b N	S	S b E	0.64	0.70	1.15	...	...	...	Do.	Clear.	Do.
4	.150	29.985	29.980	36.5	71.6	50.0	.191	.572	.309	.90	.76	.85	E	S E b S	E S E	0.00	0.20	0.00	...	...	...	Do.	Do.	Do.
5	29.831	.718	.647	46.0	68.1	53.0	.262	.380	.375	.83	.56	.93	E b N	S E b E	S b E	0.00	1.38	0.21	...	Inp.	...	C. Str. 10.	Rain.	Cirr. Str. 10.
6	.597	.617	.699	54.1	56.5	50.0	.396	.449	.309	.99	.99	.85	S E b S	N E b N	N E b N	0.25	5.80	9.81	...	0.300	...	Rain.	C. Str. 10.	Clear.
7	.759	.748	.782	43.1	69.6	53.6	.254	.400	.375	.92	.68	.93	N E b N	E b S	S E b S	4.90	2.80	0.15	...	...	...	Clear.	Clear.	Cu St. 4. A. B.
8	.895	.662	.684	42.3	78.2	58.1	.222	.550	.337	.83	.58	.70	E	S E b S	S E b S	0.20	0.00	0 01	...	...	...	Do.	Cum. Str. 4.	C. Str. 10.
9	.625	.583	.537	58.5	72.9	67.2	.476	.539	626	.97	.72	.95	S E b S	S S E	S	1.43	3.60	6.60	...	0.253	...	C. C. Str. 10.	Cir. Str. 6.	Cu. St. 2. A. B.
10	.787	.739	.866	41.0	54.5	45.2	.190	.231	.218	.74	.55	.76	W b E	W	E N E	16.06	10.40	2.70	...	...	...	Cirr. Str. 6.	Do. 4.	C. Str. 6.
11	.914	.814	.701	36.2	50.1	46.8	.170	.283	.305	.80	.78	.99	N E	N E b E	N E b E	0.20	0.93	11.86	...	0.100	...	Cum. 4.	Do. 8.	Rain.
12	.395	.411	.505	43.4	53.0	44.7	.293	.382	.241	.98	.96	.84	W N W	N E b E	S W b W	5.25	6.19	3.55	...	1.266	...	Rain.	Rain.	C. Str. 10.
13	.616	.842	30.020	43.3	52.0	42.2	.222	.232	.177	.83	.60	.66	N E b E	W	N W	17.40	14.17	8.06	...	...	...	C. Str. 4.	C. Str. 2.	Clear.
14	.990	.911	29.848	40.1	58.4	47.0	.182	.282	.273	.93	.58	.85	N E b E	S S E	S E	1.46	0.66	1.60	...	...	...	Clear.	Clear.	Do.
15	.677	.588	.641	44.5	63.2	47.5	.251	.490	.292	.84	.81	.92	E N E	E	N W	3.56	2.31	8.08	...	Inp.	...	C. Str. 10.	C. Str. 10.	C. Str. 6.
16	.860	.873	.971	39.0	49.7	42.1	.158	.182	.140	.65	.52	.53	N b W	S E b E	E	9.60	13.77	15.07	...	...	...	Do. 10.	Cum. 2.	Cl. Au. Bor.
17	.894	.816	.798	46.0	58.1	45.0	.269	.282	.257	.88	.58	.84	W	W	S b W.	1.20	1.48	4.70	...	...	...	Str. 4.	C. C. Str. 6.	C. Str. 6.
18	.762	.723	.856	43.5	47.5	45.0	.254	.320	.282	.92	.96	.96	S E	S b W	W S W	11.99	0.00	0 71	...	0.486	...	Ni. 10.	Rain.	Rain.
19	.855	.797	.850	44.1	67.2	53.0	.265	.457	.328	.92	.69	.83	W	S b W	S	1.71	1.11	1.19	...	0.646	...	C. Str. 8.	C. C. 4.	C.C.C. Lun.H.
20	.653	.600	.643	49.2	52.4	47.2	.345	.334	.320	.99	.86	.98	S	W S W	W b N	4.31	6.81	4.22	...	0.212	...	Rain.	Rain.	C. Str. 10.
21	.593	.708	.751	45.3	50.0	46.0	.275	315	.293	.92	.89	.96	N E	S W b W	N E	5 51	6.46	0.20	...	0.203	...	C. Str. 8.	Do.	Do. 9.
22	.884	.909	30.003	44 0	60.4	48.0	.279	.380	.219	.99	.76	.89	E N E	W N W	W b N	7.15	1.22	4.08	...	0.103	...	Do. 8.	C. Str. 4.	C. C. S. 7. L. H.
23	.959	.792	29.569	47.2	67.6	52.5	.256	.407	.361	.81	.63	.93	W N W	W b S	S S W	3.00	3.72	9.45	...	0.203	...	Cum. 4.	C. C. Str. 10.	Rain.
24	.365	.410	.590	52.4	61.6	53.7	.361	.338	.318	.94	.65	.73	N E b E	S S W	N E b E	7.40	12.17	3.62	...	1.606	...	Rain.	C. Str. 8.	C. Str. 6.
25	.724	.849	.821	47.4	61.1	50.5	.276	.310	.309	.86	.60	.85	N E b E	N E	E S E	1.46	8.11	3.51	...	...	...	C. Str. 8.	C. C. Str. 6.	C. Cirr. 6.
26	.823	.825	.892	51.7	73.0	56.3	.296	.416	.330	.79	.52	.75	N E b E	S E b S	S E b S	2.05	6.65	1.90	...	...	...	C. Cir. 4.	St. 10.	Str. 4.
27	.849	.845	.947	54.6	73.1	57.8	.308	.409	.268	.74	.50	.58	E b N	N E b E	N E b E	0.20	1.43	1.41	...	...	...	C. Str. 8.	C. Str. 6.	Clear.
28	30.060	29 995	.946	51.9	74.2	60.1	221	.467	.462	.59	.56	.90	W N W	E b N	S E	5.03	0.42	0.16	...	...	...	Clear.	Clear.	Do.
29	.047	.907	.811	52.1	77.6	59.0	.282	475	.358	.73	.49	.73	E	S E	S E b S	0.12	0.91	2.15	...	...	...	Cum. C. 2.	Do.	Do.
30	29.918	.805	.876	58.1	76.3	61.0	.323	.343	.436	.74	.39	.88	S E	S E	S E	0.62	3.90	1.42	...	...	...	Clear.	Do.	Do.
31	.910	.675	.608	50.0	79.9	70.1	.283	.772	.436	.78	.78	.57	S E	S S E	S S E	0.12	8.90	10.42	...	Inp.	...	Cum. C. 4.	C. Str. 6.	C. Str. 4.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR APRIL.

Barometer	Highest, the 19th day	30.203
	Lowest, the 14th day	29.256
	Monthly Mean	29.737
	Monthly Range	0.947
Thermometer ...	Highest, the 2nd day	61°1
	Lowest, the 7th day	16°0
	Monthly Mean	39°96
	Monthly Range	45°1

Mean of Humidity .... .717

Greatest Intensity of the Sun's Rays .... 94°1

Lowest point of Terrestial Radiation .... 14°7

Amount of Evaporation in inches 2.310

Rain fell on 11 days, amounting to 2.833 inches; it was raining 47 hours, and accompanied by thunder on one day.

Snow fell on one day, amounting to 2.80 inches; it was snowing 5 hours 40 minutes.

The most prevalent wind was W. N. W.

The least prevalent wind was N.

The most windy day was the 7th; mean miles per hour, 17.45.

The least windy day was the 2nd; mean miles per hour, 0.00.

Aurora Borealis visible on six nights.

The electrical state of the atmosphere has indicated high tension.

zone was in rather large quantity.

Frogs first heard the 15th day.

Swallows first seen the 15th day.

L u nar Halo visible on one night.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR MAY.

Barometer	Highest, the 3rd day	30.404
	Lowest, the 24th	29.365
	Monthly Mean	29.731
	Monthly Range	1.039
Thermometer ...	Highest, the 31st day	80°.5
	Lowest, the 14th day	30° 6
	Monthly Mean	53°62
	Monthly Range	49°9

Greatest intensity of the Sun's Rays .... 99°.9

Lowest point of Terrestrial Radiation 30.1

Mean of Humidity .... .764

Amount of Evaporation 2.89

Rain fell on 14 days amounting to 5.387 inches; it was raining 97 hours 25 minutes, and was accompanied by thunder on 1 day.

The most prevalent wind was N. E. by E.

The least prevalent wind W.

The most windy day the 13th; mean miles per hour 13.19.

Least windy day the 4th; mean miles per hour 0.06.

Aurora Borealis visible on 3 nights.

Lunar Halo on 2 nights.

The electrical state of the Atmosphere has indicated light tension.

Ozone was present in large quantity.

Shad (*Alesa*) first caught on the 29th day.

Frost occurred on the morning of the 14th day

CONTENTS.

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*** *Communications for the Journal to be addressed to the Gen[illegible] Editor,* Dr. Wilson, *University College, Toronto.*

THE CANADIAN JOURNAL.

NEW SERIES.

No. XVII.—SEPTEMBER, 1858.

SOME ETHNOGRAPHIC PHASES OF CONCHOLOGY.

BY DANIEL WILSON, LL. D.

PROFESSOR OF HISTORY AND ENGLISH LITERATURE, UNIVERSITY COLLEGE, TORONTO.

Read before the Canadian Institute, 5th Dec., 1857.

The existence of a singular class of rude primitive weapons and implements, made of stone, shell, or bone, in nearly every quarter of the globe, has excited a very general interest of late years among the archæologists of Europe. Made, as these simple relics of primitive art are, of the most facile and readily wrought materials, and by the constructive instincts rather than the acquired skill of their rude artificers, they belong to one condition of man, in relation to the progress of civilization; though pertaining to many periods of the world's history, and the most widely severed areas of the globe. In one respect, however,—and not in this one alone,—such relics possess a peculiar value to the Ethnologist, when searching into the primeval condition of our race. The materials of such infantile processes of manufacture have within themselves most frequently the evidences of their geographical origin, and in some of them also of their chronological eras. The periods to which numerous ancient sepulchral and other British and European relics pertain may frequently be determined, like those of inferior and older strata, by their embedded fossils. The bones of the *Bos primigenius* have been found indented with the primitive stone javelin of the aborigines of Northern Europe; while those of the *Megaceros Hibernicus* have been discovered alongside of the more artistic bronze weapons of

ancient Ireland. The skulls and bones of the *Bos longifrons*, tell in Britain of relics pertaining to an era not later than the Roman times; and the ornamented tusks of the Wild Boar, the bones of the Brown Bear, the teeth and skulls of the Beaver (*Castor Europæus*) the carvings wrought from the Walrus ivory, the skates formed from the metatarsal and metacarpal bones of the Red Deer and small native Horse; with numerous kindred relics of palæontology within the era of the occupation of the British Islands by man: all serve to assign approximate dates to the examples of his ancient arts which they accompany. Thus within the historic period, as in geological eras prior to the creation of man, the progress of time is recorded by the extinction of races. His advent on our earth was speedily marked by the disappearance of numerous groups of ancient life which pertain to that transition era where geology closes and archæology begins. So also the intrusion of the Roman into Britain is recorded in the extinction of many of its ancient fauna; even as the progress of the European colonist of the New World inevitably involves not only the disappearance of the wild animals which haunt its forests, but also of the Aborigines who made of them a prey.

But while the remains of extinct species thus serve—like the graven Roman or runic inscriptions on the sepulchral slab,—to fix the dates at which certain eras had their close, other accompanying objects, and chiefly the traces of living or extinct fauna, are no less valuable as fixing the geographical origin of the colonists of ancient areas, amid whose relics they are found; just as the elephants, the camels, the monkeys, and baboons, of the Nimrod Obelisk, or the corresponding sculptures on the walls of Memphis or Luxor: serve to indicate the countries whence tribute was brought, or captives were carried off, to aggrandise the Assyrian or Egyptian conquerors. Among such relics, which serve to fix the geographical centres of ancient arts, the sources of early commerce, or the birth-places of migrating races, might be noted the tin and amber of the Old, and the copper of the New World. So also in minuter analysis, we recognise among primitive American relics the local origin of various favourite materials: as the Mexican obsidian, the clay slate of the Babeens, and the favourite red pipe-stone of the *Couteau des prairies*. But it is to a more widely diffused and greatly varied class of natural products that I now refer, alike in their bearings on the chronological and geographical relations of ancient and living races, and on

the affinities traceable between primitive and modern arts and customs.

Among the productions of nature employed as materials for ornament and use, scarcely any have commanded more universal acceptance than the shells which abound, under such varied forms, on every sea coast, as well as in the deposits of fresh-water lakes and rivers. To the Conchologist they present an interesting and singularly beautiful department of nature, inviting to research amid their seemingly endless forms, and to inquiry into the habits of the "living will" that once tenanted each lovely cell :—

Did he stand at the diamond door
Of his house in a rainbow frill?
Did he push, when he was uncurl'd,
A golden foot or a fairy horn
Thro' his dim water-world? *

To the geologist the shells of the testaceous mollusks offer a department in palæontology of very wide application and peculiar value. They constitute, indeed, one of the most important among those records which the earth's crust discloses, whereby its geological history can be deciphered. But to the ethnologist and the archæologist also, they have their phases of interest, not unworthy of attention.—The mere beauty and variety of many marine shells sufficiently account for their selection as ornaments, or objects specially prized by their possessors, whether civilized or savage. These, indeed, constituted at first the sole attraction to the most intelligent collector, when enriching his cabinet with rare and costly shells, and laying the foundations for the science of conchology. To him these coveted treasures were each only "a thing of beauty," or, as in the French title of Knorr's celebrated work : "Les Delices des Yeux et de l'Esprit." But the conchologist is not singular in this respect. Other sciences besides his have had their origin in the mere aimless cupidity of the collector, which has thus amassed the materials wherewith to build a new temple to truth.

Like the precious metals, shells have been used, both in the old and new world, not only for ornament, but as a recognised currency. Of such the *cypræa moneta* is the most familiar. The cowrie shells used as currency are procured on the coast of Congo, and in the Philippine and Maldive Islands. Of the latter, indeed, they constitute the chief article of export. On the Guinea coast, and through-

* Tennyson's Maud.

out a considerable portion of Central Africa, the cowrie is still the current coin. In many parts of India, in Siam, and throughout the Burmese empire, it is universally employed as small change, and has a recognised though fluctuating value. About the middle of last century, 2400 cowries were equivalent, in Bengal, to one rupee, but increasing facilities of intercommunication have tended to multiply them and depreciate their worth. The influence of European civilization, under British rule, has in many districts displaced the primitive cowrie, by a copper and a silver currency, while the increasing monetary transactions of the most favored districts lead to the circulation even of the gold mohur, so that now, in Bengal and similar centres of commercial exchange, it requires nearly an additional thousand cowries to make up the value of the silver rupee.

Corresponding to the cowrie currency of Asia and Africa, is the use by the American Indians of the North West, of the ioqua, a shell found on the neighboring shores of the Pacific, and employed by them both for ornament and as money. The Chinooks and other Indians wear long strings of ioqua shells as necklaces and fringes to their robes. These are said to be procured only at Cape Flattery, at the entrance of the Straits of De Fuca, where they are obtained by a process of dredging, and have a value assigned to them increasing in proportion to their size. This varies from about an inch and a half to upwards of two inches in length. They are white, conical, and slightly curved in form, and taper to a point. Their circumference at the widest part does not greatly exceed the stem of a clay tobacco pipe, and they are thin and translucent. Mr. Paul Kane writes to me in reference to them: "A great trade is carried on among all the tribes in the neighborhood of Vancouver's Island, through the medium of these shells. They are valuable in proportion to their length, and their value increases according to a fixed ratio, forty shells being the standard number required to extend a fathom's length. A fathom thus tested is equal in value to a beaver's skin, but if shells can be found so far in excess of the ordinary standard that thirty-nine are long enough to make the fathom, it is worth two beavers' skins, if thirty-eight, three beavers' skins, and so on: increasing in value one beaver skin for every shell less than the standard number."

No evidence has yet appeared to indicate the use of the marine or fresh water shells of Europe as a species of currency during the era

of its primitive barbarism; but it is interesting to notice the fact that the same simple mode of employing the spoils of the sea for personal decoration, as is found prevalent among the rude Indians of the North-west at the present day, prevailed among the primitive occupants of the British isles in that dim dawn of their primeval history revealed by the disclosures of their most ancient sepulchral deposits. Among the personal ornaments found in early British graves, seemingly pertaining to a period long prior to the acquisition of the simplest metallurgic arts, are necklaces formed of the small shells abounding on the neighboring coasts, such as the *nerita littoralis*, the *patella vulgata*, and others equally common at the present day. These are perforated, like the ioqua shells of the Chinook Indian, apparently by the simple process of rubbing the projecting point on a stone, and thus converted into shell-beads, they were strung together with a fibre or sinew. It may also be noted that, as among the savage Indians of this continent such personal ornaments are not confined to the squaws, but more frequently adorn the person of the brave, and mingle with the scalp-locks and other war-trophies of the most celebrated chief: so was it with the allophylian savage of Britain's primeval centuries. Bead necklaces occur alongside of the stone war-hatchet and flint lance-head, as the property of the warrior, and one of his most prized decorations. Possibly, indeed, they may have constituted the symbols of rank, and the special badge of office, as considerable variety marks their forms. An Orkney stone cist, for example, contained about two dozen of the common oyster shells each perforated, and in all probability designed to be strung together as a collar, abundantly noticeable for size, if not for beauty. In some cases, the form of these shells, as well as of those of the limpet (*patella vulgata*), and of the cockle (*cardium commune*), are taken advantage of to form a novel shell-ornament. They are rubbed down until they are reduced to rings, which were either strung together, or attached, as ornaments, to the dress. Underneath a large cromlech, accidentally discovered in the Phœnix Park at Dublin, in 1838, in the process of levelling a mound, which thus proved to be an ancient tumulus, two male skeletons were found, and beside each skull lay a quantity of the common littoral shells, *nerita littoralis*. "On examination," it is noted in the report of the Royal Irish Academy, "these shells were found to have been rubbed down on the valve with a stone, to make a second hole, for the purpose, as

it appeared evident, o their being strung to form necklaces; and a vegetable fibre, serving this purpose, was also discovered, a portion of which was through the shell." Alongside of these also lay a knife, or arrowhead, of flint, and a small fibula of bone, but no traces of metallurgic arts.

Sir Thomas Browne has remarked in one of his quaint, beautiful fancies: "Time conferreth a dignity upon the most trifling thing that resisteth his power;" and as the uses to which the primitive British savage applied the commonest and least attractive of the shells of his Island coasts, for the purposes of personal adornment, confer an interest on them for us, as illustrations of the universal prevalence of certain innate ideas which may almost be characterised as instincts in man: so too may we discover, even in the rudest traces of primeval culinary arts, some glimpses of forgotten truths, that will help to illuminate the past history of the human race. Amid the widening clearings of this new continent, where the natural forest still bounds our horizon, and the rude Indian savage who once found in it his free hunting-grounds, has not yet entirely disappeared from our midst, it requires no great stretch of imagination to picture to our own minds what the researches of the archæologist have disclosed relative to Europe's primeval human era. From evidence of a very varied kind, for example, it has been deduced, that, many ages prior to the earliest authentic historical notices, the British islands were occupied by a human population, even more imperfectly furnished with the means of coping with the difficulties and privations of savage life than the rude tribes of our north-western wilds. Nor was it man alone that then existed in a savage state. Searching amid the records of that debateable land to which the geologist and the antiquary lay equal claim, we learn that vast areas of the British islands were covered at that remote era with the primitive forest; that oaks of giant height abounded where now the barren heath and peat-bog cumber the land; and that even at a period recent, when compared with that primeval era, the fierce Caledonian bull, the wolf, and the wild boar, asserted their right to the old forest glades. The scanty human population was thinly scattered along the skirts of this continuous range of forest, occupying the coasts and river valleys, and retreating only to the heights, or the dark recesses of the forest, when the fortunes of war compelled them to give way before some more numerous or warlike rival tribe. Thus confined

to the open country along the coasts and estuaries, the products of the sea, and especially the edible mollusca, formed no unimportant source for their precarious supplies of food.

Among the interesting illustrations of that common transitional ground on which the geologist and the archæologist meet, few have attracted greater attention than the celebrated Kent's Hole Cave, near Torquay, Devonshire. It has furnished many of the later palæontological specimens which now enrich the collections of the British Museum; and to its disclosures both Buckland and Owen have acknowledged their obligations for some of their most important data. The roof of the cave is clustered with pendant cones of stalactite, and the floor thickly paved with concretions of stalagmite, the accumulations of many centuries. Beneath and embedded in this have been found numerous relics of primitive savage life, intermingled with the remains of the rhinoceros, the hyena, and great cave-tiger, *felis* and *hyena spelæa*, the *ursus spelæus* or cave bear, along with those of other extinct mammals. Among these, though in more superficial deposits, lay traces of the rude culinary practices, illustrative of the habits and tastes of the primeval British savage. These are minutely described in the notes of the Rev. J. McEnery, by whom the cave was first explored. Fragments of sun-baked primitive pottery of the rudest description, rounded slabs of slate of a plate-like form, broken and calcined bones, charcoal and ashes, all served to show where the hearth of the old barbarian Briton had stood; and along with these lay dispersed, flints in all conditions, from the rough pebble as it came out of the chalk, through the various stages of progress, on to the finished spear and arrow-heads and hatchets of flint; indicating that the ancient British troglodyte had here his workshop as well as his kitchen, and wrought the raw material of his primitive manufactures into the requisite tools and weapons of the chase. Other articles, including lance-heads, bodkins, and objects of unascertained uses,—hair-combs or netting tools,—all made of bone, lay amid the accumulated chips and splinters of flint and bone; while nearer the mouth of the cave lay a larger collection of shells of the muscle, limpet, and oyster, indicating that the ancient British aborigines found their precarious subsistence from the alternate spoils of the chase and of the sea. Nor were indications wanting of just such applications of the pearly inner laminæ of the oyster and other shells for the purposes of ornament, as may be observed in the grotesque inlaid carvings of the

Polynesian savage at the present day. The like traces of the primitive habits of the aboriginal allophylæ of the northern parts of the British mainland and the neighboring islands have been noted. On exploring, one remarkable example of the subterranean stone dwellings of the ancient population of the Orkneys,—opened by Lieutenant Thomas, R. N., and a party of the Admiralty Survey Service in 1848,—the remains of the charcoal and peat-ashes of the long-extinguished hearth lay intermingled with bones of the horse, ox, deer, and whale; and also with some rude implements illustrative of primitive Orcadian arts; while a layer of shells of the oyster, escallop and periwinkle, the common whelk, the purpura, and the limpet, covered the floor and the adjacent ground, in some places half a foot deep. Of these, the limpet, though common on the coast, formed only a very small proportion of the whole; while the periwinkle was the most abundant. The relative accumulations of the other shells,—differing as they did from the present ratio of the various mollusca on the neighboring shores,—in like manner furnish some slight index of the culinary taste of the aboriginal Briton in those long-forgotten centuries.

It is curious and instructive thus to note even so small a matter as the tastes of the rude barbarian Briton of these long-forgotten centuries, for they supply a means of comparison between the very diverse races of the British Islands in remotely ancient and modern times. The periwinkle is now annually shipped in large quantities from the Scottish coasts to supply the markets of the British metropolis; and at the recent meeting of the British Association at Dublin, Mr. Patterson read a paper before the zoological section, tending to show that such is the demand for that favorite mollusk that it is in danger of being extirpated on the Irish coasts. The quantity of Litorina, littoral periwinkles, shipped at Belfast during the four previous years, according to the returns of the Secretary to the Harbor Commissioners of that port, amounted in 1853 to 1,034 bags, containing 181 tons; in 1854 to 2,626 bags, or 459½ tons; and in 1855 to 2,286 bags, or 400 tons; while in 1856 it fell off to 786 bags, or 137 tons. The diminished exports of the last year have not arisen from any decrease in the demand. Such of the mollusca as are not procured for this export trade in the Bay of Belfast are principally collected on the coasts of the County of Down; but the banks from which they were formerly derived are no longer capable of supplying the market, and the deficient quantity is at present brought from Stanraer to Belfast,

and thence reshipped to London. But the attention of the scientific zoologist must now be turned to the habits of these and others of the favorite mollusca, and to the circumstances and seasons in which their ova are developed, otherwise they will speedily be classed among those extinct species which have owed their extirpation to the presence and influence of man.

By such facts the remote past is brought once more into intimate relation with the present; and even in matters so apparently trivial as the nice discrimination of the palate between the *Patella vulgata* and the *Turbo littoralis*, we thus detect a correspondence between the tastes of the rude aboriginal savage of primeval centuries, and the civilized Anglo-Saxon of the British metropolis; though even now it is as a popular favorite, and not as a coveted delicacy, that the periwinkles, and also the larger *Buccinum undatum* or waved whelk, are imported into London, and gathered on the Scottish and Irish coasts.

At Skara, near the house of Skaill, in the west mainland of Orkney, one of a singular class of stone structures, designated *Pict's houses*, is remarkable for an immense accumulation of ashes around it, several feet in thickness, plentifully mixed with shells, and the horns and bones of deer and other animals. The building itself has been only very partially explored, but many curious relics have been recovered from the surrounding debris. Among these are circular discs of slate, similar to those found in Kent's Hole Cave, a large tusk of a wild boar, horns of the red deer, and numerous implements made of horn. But not the least curious of these primitive relics was a box—already referred to,—constructed of stones laid together, in the form of a miniature cist, within which lay about two dozen oyster shells, each pierced in the centre with a hole about the size of a shilling. Oysters, it may be remarked, are rare in Orkney. They now occur only at two places, Deersound and Frith, the nearest of which is eight miles distant from Skaill; while the osteological remains which accompanied them are those of long extinct Orkney mammals. There is no tradition of the presence either of the deer or the boar in the Orkney islands, unless the names of the Deerness headland and the neighbouring sound be assumed as topographical memorials of the presence of the former within Norse or Saxon times. It is scarcely possible, indeed, to conceive of the existence of such *feræ naturæ* for any length of time, within so small an area, after the occupation of these islands by a human population.

At a period which may be assumed as greatly more modern than the era of those singular subterranean dwellings of primitive centuries, we once more meet with extensive accumulations of oyster shells, with those of the cockle and muscle, among the miscellaneous remains on Romano-British sites of the first centuries of the Christian era, alongside of bones and tusks of the British boar, and of other extinct animals, deer and oxen, the latter the *bos longifrons*, which appears to have been the domesticated ox of early Celtic times. But such Roman deposits of the shells of British mollusca are no longer confined to coast stations; as indeed might be anticipated when it is remembered that the voluptuous Roman esteemed the oysters of the British seas so great a delicacy, in comparison with those of his own mediterranean shores, as to transport them to Italy to add a new zest to his luxurious board. Pliny records the high estimation in which the British oyster was held at Rome, and Juvenal has satirised the excessive refinement of the epicurean taste which could discriminate between the oyster of the Kentish coast, and those of Circæan sands or rocky Leucrine shores:—

> "Circæis nata forent, an
> Lucrinum ad saxum, Rutupinove edita fundo,
> Ostrea, callebat primo deprendere morsu;
> Et semel adspecti littus dicebat echini."—Sat. IV., l. 140.

It may also be noted that the shell of the common snail is found in such quantities on Roman sites, and occasionally also in Anglo-Saxon graves, as to lead to the belief that it constituted another choice delicacy at the tables of those successive colonists of celtic Britain.

Considerable interest has been excited among Danish antiquaries, in recent years, by the explorations of large accumulations of the shells of mollusca, met with at various points on the coasts of Denmark. These, which were at first regarded merely as natural deposits, the remains of the abundant fauna of the neighbouring seas, have proved on examination to come within the province of the archæologist, and special steps have been taken to secure their thorough investigation. Within them have accordingly been found implements of bone, pottery, hatchets formed of stags' horns, &c., and in one examined by the distinguished Danish antiquary, Mr. Worsaae, chiefly consisting of oyster-shells, he found numerous skulls and bones of animals, flint celts and arrow-heads, bones broken, as has been supposed, for the purpose of extracting the marrow, charcoal, and other traces of the early occupants of the Danish coasts.

Similar accumulations of the shells of a species of *Ampullacera*, largely eaten by the New Zealanders, have been observed, along with various marine and other debris, including relics of native art, on deserted sites along the New Zealand shores, although they have not hitherto attracted more than a passing notice. But a greater interest has been excited by extensive deposits of marine shells on different points of the North American coasts, accompanied with evidence of artificial accumulation, not likely to escape the attention of those who in this New World watch with so keen an eye for the slightest traces of an ante-Columbian history. The abundant and large sized edible mollusca of the North American sea-coasts could not fail to attract the notice of an improvident and savage people, dependent on the precarious products of the chase. Large banks of fossil shells occur in many localities, where the changes in the relative levels of sea and land have left these at considerable elevations, and far removed from the modern beach. On such a bed of shells, of the *Gnathodon*—formerly a favorite food of the Indians—the city of Mobile is built; and amid these natural accumulations of older centuries, occasional indications of the former presence of the American aborigines have been met with on the site of the modern city. But the following narrative, by Sir Charles Lyell, in his second tour in the United States, furnishes an interesting illustration of primitive American traces of ancient culinary tastes and habits, analagous to those of Europe already referred to. Describing his journey through a part of Georgia, and his explorations of the lagoons of the Altamaha, Sir Charles remarks: "We landed on the north-east end of St. Simon's island, at Cannon's Point, where we were gratified by the sight of a curious monument of the Indians, the largest mound of shells left by the aborigines in any one of the sea islands. Here are no less than ten acres of ground, elevated in some places ten feet, and on an average over the whole area, five feet above the general level, composed throughout that depth of myriads of cast away oyster shells, with some muscles, and here and there a mediola and helix. They who have seen the Monte Testaceo, near Rome, know what great results may proceed from insignificant causes, when the cumulative power of time has been at work, so that a hill may be formed out of the broken pottery rejected by the population of a large city. To them it will appear unnecessary to infer, as some antiquaries have done, from the magnitude of these Indian mounds, that they must have been thrown

up by the sea. In refutation of such an hypothesis, we have the fact that flint arrow-heads, stone axes, and fragments of Indian pottery have been detected through the mass. The shell-fish heaped up at Cannon's Point must, from their nature, have been caught at a distance, on one of the outer islands, and it is well known that the Indians were in the habit of returning with what they had taken, from their fishing excursions on the coast, to some good hunting ground, such as St. Simon's afforded." This remarkable "Monte Testaceo" of the New World is interesting to us as one of the melancholy memorials of its aboriginal races, already vanished, or hastening to extinction; while in this case the edible treasures of the deep, unlike those of the cleared forests, still remain to supply the means of subsistence, or to furnish coveted luxuries for the tables, of the old Indian's supplanters.

Another interesting class of illustrations of the subject in hand might be derived from tracing in the diverse applications of convenient or graceful univalve and bivalve shells to purposes of ornament or use, affinities in the tastes and ideas of man under the most diverse social conditions, and in ages widely remote from each other. In the mother-of-pearl work, and other applications of shells in modern ornamentation, we have examples of art which find their analogous types in the rudest traces of primitive taste and artistic skill. Still further in the adaptation of many beautiful marine shells as brooches, jewel cases, drinking cups, bowls, and lamps, and even as reliquaries and fonts, we may study the matured development of such applications of these spoils of the ocean to the purposes of personal adornment or of convenient use. But it would tempt us into too wide a field to illustrate all such economic and artistic adaptations of shells from the *fusus antiquus*, still used as a lamp in the humblest cottages of the Zetlanders, to the varieties of the exquisitely graceful and often richly jewelled nautilus cup, or to the *Tridacna gigas* employed in churches for benitiers or holy water stoups, and the still larger bivalve, the *Chama gigas*, which may be seen tastefully adapted, not only as the basin for the ornamental garden fountain, but even as the singularly appropriate and beautiful baptismal font.

Among the charges of medieval heraldry, the scallop shell, *pecten Jacobæus*, plays a prominent part as the ancient badge of pilgrimage. Fuller, in his *Church History*, repeatedly refers to such heraldic bearings; noting, for example, in his own quaint way, in reference to

the arms of St. James' Abbey, Reading: *azure, three scallop shells, or;* "Here I know not what secret sympathy there is between St. James and shells, but sure I am that all pilgrims who visit St. James of Compostella in Spain (the paramount shrine of that saint,) returned thence *obsiti conchis*, all beshelled about on their clothes, as a religious donative there bestowed on them." On another occasion the old Church Historian suggests no unlikely origin for the escallop as the pilgrims' badge, noting in reference to the Dacres Arms: gules, three scallop shells, argent; "which scallop shells (I mean the nethermost of them, because most concave and capacious), smooth within, and artificially plated without, was ofttimes cup and dish to the pilgrims in Palestine, and thereupon their arms often charged therewith." But though the scallop undoubtedly came to be adopted as the general badge of the palmer, its true heraldic symbolism is referred to St. James the Great; whence its designation as St. James' cockle shell, *coquille de S. Jacques* and *Pecten Jacobæus;* and its strict ecclesiastical significance was as the memorial of pilgrimage to the shrine of St. James of Compostella. Southey has translated from the *Anales de Galicia*, the ancient legend of the *Sanctoral Portugues*, relative to the origin of St. James' cognizance, and the miraculous conversion of a Paynim knight of Portugal to the Christian faith; the truth of which legend is avouched by the Bulls of three successive Popes, which empower the Archbishops of Compostella to excommunicate all who sell the scallop shells to pilgrims except in the city of Santiago. A still more extraordinary and miraculous legend of "Saint Cock and the Holy Hen of Compostella," derived from the *Acta Sanctorum*, and other equally authentic sources, forms the subject of the metrical tale to which the poet Southey has appended the notes above referred to in vindication of Santiago of Galicia's exclusive right to the scallop badge.

> The poor with scrip, the rich with purse,
> They took their chance for better or worse,
> From many a foreign land,
> With a scallop shell in the hat for badge,
> And a pilgrim's staff in hand.
>
> For the scallop shows in a coat of arms,
> That of the bearer's line,
> Some one in former days hath been
> To Santiago's shrine.

From the adoption of the cognizance of St. James of Compostella as the general badge of pilgrimage, the scallop not only took its place

in the arms of various religious houses, as well as of individual palmers and crusaders of rank: but it was adopted among the insignia of more than one medieval order, and as such re-appeared in a form analogous to the more ancient collars and necklaces of primitive British graves. The knights of the Order of St. Louis, instituted by that royal crusader, Louis IX., received from their escallop badge, the title *du navire et des coquilles;* and those of St. Michael, another French order instituted by Louis XI., wore a golden collar of scallop shells, and thence were styled *chevaliers de la coquille*.

A reference to these relics of medieval pilgrimage would not be complete without noticing the convenient argument resorted to by Voltaire, to upset the evidence adduced by the geologists of the eighteenth century, from the abundance of fossil shells found in the interior of continents, and at high elevations, in proofs of a universal deluge. Compared with the conclusions of the diluvial geologist, even the exploded theories of the sixteenth and seventeenth centuries recovered favor in the estimation of the sceptical philosopher. "Perhaps," says Dr. Plot, in his *Natural History of Oxfordshire,*"* they may have remained from the creation, when God dispersing the seminal virtue of animals through the universe, where it met with an agreeable matrix, as in the waters, there it produced shell fish in their perfection, and where it met with an improper matrix, as in the earth, imperfection only. However, as Gaffarell thinks, it proceeded as far forth as it could, and gave the same shape to stones, earths, &c., as it should have done to the shellfish!" Shifting his ground, however, from such pleasant fancies of older philosophers, which, like the ingenious analogies of the modern author of *Omphalos,* thus easily accounted for fossils as the abortions or mere sports of nature: Voltaire admitted the marine origin and genuineness of fossil shells gathered on the Alps and other elevated inland regions, but with specious sophistry accounted for their presence in such unlikely localities, by affirming that they were eastern specimens dropped by pilgrims returning from the Holy Land! The sophistical argument, could it only be maintained, would furnish evidence of an antiquity and universality of pilgrimage to eastern shrines, such as never entered into the most enthusiastic dream of medieval hagiologist, or monkish chronicler of palmers' adventures.

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*Plot's Nat. His. of Oxfordshire, 2d edition, p. 144. N. & Q., 2d series, p. 82, Jan. 31, 1858.

To the absence of all knowledge of the metallurgic arts among primitive nomade tribes, or to the want of the metals themselves, as among the natives of the Australasian Archipelago, may be ascribed many of the economic uses to which sea shells have been so widely applied. They illustrate in a striking manner the adaptability of man to the most varied physical conditions of the globe, and frequently exhibit the imperfectly developed reasoning faculties of the savage, working within narrow limits, akin to the instincts of the lower animals. Thus we find curious accidental affinities between the rude primitive arts of the European savage in the dim dawn of the ancient world's prehistoric centuries, the equally rude arts of the Carib or the Guanche of the Antilles when brought to the knowledge of the old world in the fifteenth century, and the simple devices of the Polynesians occupying the Volcanic, or Coral Islands of the Southern Ocean, first visited by Europeans in the eighteenth century. Owing to the absence, on many of the islands of the Australian Archipelago, not only of metals, but even of stone and wood, marine shells form the most important available material alike for economic utility and ornament; and the same appears to have been the case, to a great extent, among the Indians of the Antilles in ante-Columbian centuries. The extreme beauty of many of the marine productions of the tropics and the Southern Ocean, sufficiently accounts for their adoption for personal adornment, as in the case of the *Cypræa aurantia*, or beautiful orange cowry, of which specimens are rarely to be met with undrilled, owing to its use as a favorite ornament of the natives of the Friendly Islands. But these spoils of the ocean acquire an additional value, when, as in Central Africa, or among the American Indians around the head waters of the Mississippi, they have all the added virtues which rarity confers. Dr. Livingston, when leaving the Belondas after a brief sojourn among them, thus records his friendly parting with their chief: "As the last proof of friendship, Shinte came into my tent, though it could scarcely contain more than one person, looked at all the curiosities, the quicksilver, the looking-glass, books, hair brushes, comb, watch, &c., &c., with the greatest interest; then closing the tent, so that none of his people might see the extravagance of which he was about to be guilty, he drew out from his clothing a string of beads, and the end of a conical shell, which is considered, in regions far from the sea, of as great value as the Lord Mayor's badge is in London. He hung it round my neck, and said,

'There, now, you have a proof of my friendship.' My men informed me that these shells—a species of conidæ—are so highly valued in this quarter as evidences of distinction, that for two of them a slave might be bought, and five would be considered a handsome price for an elephant's tusk worth ten pounds." But even more curious is it when such sea-wrought treasures are found employed not as the ornaments, but as the substitutes for dress, as among the natives of Darnley Island, an island of volcanic origin, off the coast of New Guinea, visited by Her Majesty's ship Fly in 1842–6. The natives are described as fine, active, well-made fellows, rather above the middle height, of a dark brown or chocolate color. "They had frequently almost handsome faces, aquiline noses, rather broad about the nostrils, well-shaped heads, and many had a singularly Jewish cast of features. * * * They were entirely naked, but frequently wore ornaments made of mother-of-pearl shells, either circular or crescent-shaped, hanging round their necks. Occasionally, also, we saw a part of a large shell, apparently a cassis, cut into a projecting shield-shape, worn in front of the groin." Among these islanders also, the larger sea shells have to perform the functions which are so abundantly provided for, in the western Archipelago, by the Calabash. Their adaptability for this purpose, indeed, naturally suggests such an application of them wherever they abound, as in the case of the *Buccinum dolium*, frequently in use by the fishermen and mariners of the tropics as a convenient utensil with which to bale their boats. So in like manner the graceful trumpet-like form, and richly variegated colors, of the larger species of the Tritons, such as the beautiful *Triton variegatus*, render their early and independent application as horns or musical instruments, alike by the islanders of the Pacific and the Carribean sea, sufficiently natural and obvious.

Though the rude natives of the Antilles, when first visited by the Spaniards, possessed some natural advantages over the inhabitants of the volcanic and coral islands of the Pacific, yet the large marine shells with which the neighboring seas abound, constituted an important source for the raw material of their primitive implements and manufactures. The great size, and the facility of workmanship of the widely diffused *pyrulæ, turbinella, strombi*, and others of the larger shells, have indeed led to their application, wherever they abound among uncivilized nations, to numerous purposes elsewhere supplied from other sources. Of these the Charibs made knives,

lances, and harpoons, as well as personal ornaments; while the mollusk itself was sought for and prized as food. The *strombus gigas* is still fished for the table off the Island of Barbadoes, and numerous ancient weapons and implements made from its shell have been dug up on the island. Pearls also, of a beautiful pink color, are occasionally formed by this shell-fish, and from their rarity are greatly valued; while the modern adaptation of the ancient cameo-engraver's art to shells, as well as their employment in the production of the finer porcelain and miniature statuary, have led to those beautiful marine products of the American tropics being more sought after, in Europe, for the manufacture of personal ornaments and other works in the highest class of art, even than the coveted secretions of the *meleagrinæ*, brought from the pearl fisheries of Ormus or Ceylon, or from the Bahrein Islands in the Persian Gulf.

Thus the necessities of man in the savage state, and the ever-varying devices to gratify the luxurious exactions of civilization, have equally contributed to the ingenious application of the shells, and other products of molluscous animals, to the use of man. Under this head we might refer to the *murex trunculus* of the Mediterranean, the source, as is believed, of the celebrated Tyrian purple of the ancient world; and to others of the genus *purpura*,—such as the *purpura lapillus*,—which have also been turned to use by the dyer. The various pearl-producing species of the *meleagrina*, in like manner illustrate the refinements and excesses of ancient and modern luxury. The orient pearl of the Egyptian queen, "The treasure of an oyster," and the occidental pearl of Philip II., from St. Margaritas, the pearl island of our New World, which weighed 250 carats, and was valued at 150,000 dollars; or again the still more costly pearl of Louis XIV., brought from Catifa on the Arabian Coast, by his excentric protégé, Jean Baptiste Tavernier, the son of an Antwerp engraver whom the Grand Monarch created Baron d'Aubonne, and who paid for his Arabian pearl the almost incredible sum of £110,000. Great as are the sums still annually expended on the produce of the pearl fisheries for the gratification of eastern and western luxuriance of ornamentation, the Antwerp adventurer has secured the palm for the licentious Court of Louis le Grand. The most abundant annual pearl harvest in the world is believed to be the product of the Bahrein Island fisheries, in the Persian Gulf, but the revenue of this falls somewhat short of £100,000 sterling, even in the most prolific years. Pearls to the

value of from forty to sixty thousand pounds sterling are annually imported into Britain. France and other countries of Europe also receive large annual importations of the same costly marine production; while oriental luxury absorbs a still greater amount. Ingenious means are accordingly resorted to for supplying the enormous demand. The Chinese practice one successful mode, by inserting into the living animal a silver wire with a nucleus for the pearl to form upon. Still further improving on this process of making the living pearl-muscle an obedient worker in their service, they not only produce pearls of various sizes and qualities by the introduction of pieces of wood, baked earth, &c., into the living animal, which it covers with the nacrous deposit which converts them into marketable pearls; but also small metal figures of Buddha, in the sitting posture in which the divinity is usually portrayed, are treated in a similar manner. These miniature pearl-encased penates are highly valued by the Chinese as charms, and produce large prices. But while thus dwelling on the prolific pearl productions of southern seas, it must not be forgotten that Britain has also her pearl-producing bivalve. The river pearl-muscle, *unio margaritiferus*, is found in various Scottish rivers, but chiefly in the Tay. There was formerly an extensive pearl-fishery extending from Perth to Loch Tay, and the pearls sent from thence from 1761 to 1764 have been estimated in value at £10,000. Single pearls are still procured from the Tay, which readily sell at from one to two pounds sterling.

The discovery of the economic use of the larger *strombinæ* as an important material in the manufacture of porcelain, as well as the introduction of the practice of working camei on these shells, and the increasing demand for this beautiful and artistic class of personal ornaments, have united to create a novel trade in the gigantic tropical shells. Immense quantities of the *strombinæ* are now annually brought to Europe, and so many as three hundred thousand shells of the *strombus gigas* and *strombus pugilis* have been imported from the Bahamas to Liverpool alone, in a single year.

Did the object of this paper require a minute consideration of the modern economic applications of shells and other marine products, it might be greatly extended by reference to the varied applications of mother-of-pearl shells to all the purposes of inlaying, carving, and decorating. The value of the shells imported in recent years into Britain for this class of manufactures alone, has fallen little short,

annually, of £40,000 sterling. The uncut cameo shells of various kinds, including the products of widely distant seas,—*e. g.*, the *cassis rufa*, or bull's mouth; the *cassis Madagascariensis*, the black helmet, or queen couch; the *cassis cornuta*, or horned helmet; the *strombus gigas*, or fountain shell: the *strombus pugilis*, and the *pyrula carnaria*, are annually imported to the value of upwards of £3,000 sterling, and, in the hands of the cameo engraver, are speedily converted into valuable works of art. But the modern application of marine shells for the purposes of ornament and utility, bring them within the range of most modern trades. Buttons, studs, knife-handles, paper-cutters, pen-holders, card-cases, parasol handles, card-counters, jewel and needle cases, snuff-boxes, thimbles, richly carved and jewelled brooches, beads, necklaces, and artificial flowers, are all made from these varied spoils of the sea. The ingenious Chinese turn them to numerous uses, one of the most noticeable of which is to supply a substitute for glass. Various species of the *placuna*, as the *p. sella*, and *p. placenta*, being thin and translucent, are used in China for glazing windows and for lanthorns; while the powdered dust of the same shells furnish the silver pigment for their water-color drawings.

While thus noting with interest the development of novel and varied modern arts which turn the spoils of the ocean to such diverse uses, and lead to the transport of the gigantic marine shells alike of the Indian Ocean and the Antilles, to the marts of the old world, to contribute to European luxury and refinement: a greater interest attaches to the evidences, still traceable, of an ancient trade in the same products of the Florida Gulf, carried on among the widely scattered tribes and nations of the New World, before its discovery by Columbus. Reference has already been made to the varied uses to which these tropical shells were applied by the insular Indians of America, when first discovered by the Spaniards, but their economic employment was not limited to the inhabitants of the islands. Abundant evidence exists to prove that they were greatly valued, and even regarded with superstitious reverence, both by the more civilized nations of the neighboring mainland around the Gulf of Florida, and also by the rude Indian tribes even so far north as beyond the shores of our Canadian Lakes. In one of the singular migratory scenes of the ancient Mexican paintings, copied in Lord Kingsborough's "Mexican Antiquities,"* from the Mendoza Collection, preserved among

* Lord Kingsborough's "Mexican Antiquities," Vol. I., plate 68.

the Selden MSS. in the Bodleian Library, at Oxford, a native figure is represented carrying a large univalve shell in his hand. He is barefooted, and dressed only in a short, spotted tunic, reaching to his loins. In his right hand he bears a spear, toothed round the blade,—it may be with inserted flints or points of obsidian,—while he holds the large shell in his left hand. A river which he is passing is represented by a greenish stripe winding obliquely across the drawing, and his track, as indicated by alternate footprints has previously crossed the same stream. On this trail he is followed by other figures nearly similarily dressed, but sandalled, and bearing spears and large fans; while a second group approaches the river by a different trail, and in an opposite direction to the shell-bearer. Other details of this curious fragment of pictorial history are less easily interpreted. An altar, or a temple, appears to be represented on one side of the stream; and a highly colored circular figure, like a shield, on the other, may be the epitomised symbol of some Achæan land or Sacred Elis of the New World. But whatever be adopted as the most trustworthy interpretation of the ancient hieroglyphic painting, its general correspondence with other migratory depictions is undoubted; and it is worthy of note, that, in some respects, the most prominent of all the figures is he who is represented as fording the stream, bearing one of the large tropical univalves in his hand.

The evidence which such a remarkable native record affords of an importance attached to the large sea shells of the Gulf of Mexico, among the most civilized of the American nations settled on its shores, is well deserving of notice; but the same class of tropical marine products acquire a new and still more important significance when they are met with among the relics pertaining to Indian tribes settled in the northern regions of this continent, some of them two to three thousand miles distant from the native habitat of the mollusca by which these coveted treasures of the ocean are produced, and separated by hundreds of miles from the nearest sea coast.

Tracing them along the northern route through the Mississippi and Ohio valleys, these shells have been found in the ancient graves of Tennessee, Kentucky, and Indiana, and northward to the regions of the Great Lakes. Dr. Gerard Troost, in a communication to the American Ethnological Society,* has described a singularly

* Transactions Amer. Ethnol. Soc., Vol. I. pp. 355—365.

interesting series of disclosures of ancient relics and sepulchral remains in Tennessee. The crania of the graves were characterized by remarkable artificial compression, as in the example figured by Dr. Morton, plate 55, *Crania Americana*. These ancient graves abounded with relics, "Cases, trinkets, and utensils; all of a very rude construction, and all formed of some natural product, none of metal." From an examination of these, Dr. Troost was led to the conclusion that the race to whom they pertained came from some tropical country. Numerous beads were formed of tropical marine shells of the genus *marginella*, ground so as to make a perforation on the back, by means of which they could be strung together for purposes of personal ornament. Plain beads were made from the columellæ of the *strombus gigas;* and such columellæ were found worn to a uniform thickness, perforated through the centre, and in all stages of manufacture, from the rude state in which such are found on the island shores of the West Indies, to their condition as perfected beads and links of the much prized *Wampum.* But another conchological relic of the same locality possesses a much greater

interest. Dr. Troost describes and figures various rudely modelled and sculptured idols found in the same locality; from some of which

he was led to assume the existence of Phallic rites among the ancient idolators of the Ohio valley. One of these specimens of aboriginal sacred sculpture was accidentally discovered in ploughing a piece of land newly reclaimed from the forest. The utensils found in the Tennessee graves have all been made of stone or obsidian; and the greater number of the idols are in like manner sculptured in stone of various kinds and degrees of hardness. But the figure now referred to is made of clay and pounded shells, and, like other examples which have been met with, has been hardened in the fire. It represents a naked human figure, kneeling, with the hands clasped in front; and when found, it still occupied as its primitive niche or sanctuary, a large tropical shell, *(Cassis flammea,)* from which the interior whorles and columella had been removed, with the exception of a small portion at the base, cut off flat, so as to form a pedestal for the kneeling figure. The special application of this example of the tropical cassides, thus found so remote from its native habitat, adds a peculiar interest to it, as manifestly associated with the religious rites of the ancient race by whom the spoils of southern seas were transported inland, and converted to purposes of ornament and use.

The discovery of examples of similar tropical relics, or of articles of personal ornament fashioned from them, when found to the north of the Great Lakes, is still more calculated to excite surprise, though the chief interest they possess is from the light they are calculated to throw on the traces of ancient migration, or of traffic between the north and south, in ages prior to the displacement of the Red Man by the European. Two of such large tropical shells, both of them specimens of the *pyrula perversa*, the native habitats of which are the Antilles, and the Bay of Campeachy on the main land, have been presented to the Canadian Institute; not as additions to its specimens of native conchology of the tropics, but as Indian relics pertaining to the great northern chain of fresh water lakes. The first of these was discovered on opening an Indian grave-mound, at Nottawasaga, on the Georgian Bay, along with a gorget made from the same kind of shell. The second example was brought from the Fishing Islands, near Cape Hurd, on Lake Huron, and a third specimen, now the property of James Beaty, Esq., Toronto, partially honey-combed by age and decomposition, constituted one of the contents of a large sepulchral depository in the same Northern Lake

district. It was found lying at the head of one of a group of Indian graves, along with a copper kettle, and other relics; and belongs, I believe, to an interesting series of Indian relics, discovered, along with sepulchral remains, in 1846 and 1847, in different parts of the district lying between Georgian Bay and Lake Simcoe, and described by Dr. E. W. Bawtree, in the Edinburgh Philosophical Journal for July, 1848. In one pit, about seven miles from Penetanguishene, three large couch shells were found, along with twenty-six copper kettles, a pipe, a copper bracelet, a quantity of shell beads, and numerous other relics. The largest of the shells,—a specimen of the *pyrula spirata*,—weighed three pounds and a quarter, and measured fourteen inches in greatest length. But a piece had been cut off this and another of the large shells, probably for the manufacture of beads. It exhibited abundant marks of age and frequent handling, its outer surface being quite honey-combed, while the inside retained its smooth lamellated surface. Another sepulchral depository, about two miles from the former, yielded a large number of shell-beads of various sizes, along with other relics; a third, discovered on elevated ground in the neighboring Township of Oro, contained twenty-six copper kettles, underneath one of which lay another of the large tropical shells, seemingly carefully packed in beaver-skins and bark; while in a fourth cemetery in the same district, among copper arrow-heads, bracelets, and ear-ornaments, pipes of stone and clay, beads of porcelain, red pipe-stone, &c., sixteen of the same prized tropical univalves lay round the bottom of the pit arranged in groups of three or four together. Numerous skeletons, or detached skulls and bones promiscuously heaped together along with these relics, attested the sepulchral character of the depository. The kettles also had been rendered useless by the blows of a tomahawk, according to the invariable practice of the Indians with the offerings deposited alongside of their dead. In more than one of these cemeteries there were also found iron axes and other relics which sufficed to fix the date of some, at least, of the interments subsequent to intercourse having been established between the Indians of this district and Europeans. More recently, in 1856, an extensive Indian cemetery was disturbed in the same locality, and found to correspond very closely to those already described. About six miles from Orillia, where the North River crosses the Coldwater road, which is on the line of the old portage between Lake Couchiching and the Georgian Bay, it runs through a valley with low heights rising on either side.

On the northern height, about a quarter of a mile from the road, the Indian relics now referred to were found. Many skeletons were disturbed, and along with these were numerous specimens of native art, beads and other ornaments of bone, some curious rings made from the vertebræ of the sturgeon; and also glass beads and copper kettles, some of the latter with handles and rims of iron. Beside these miscellaneous relics lay two of the large univalve shells of the tropics. In this, as in the former cases, the traces of European art fix the date of the deposit at a period subsequent to the discovery of America by the Spaniards, and in all probability to the explorations of the French among the Hurons of this district in the early part of the seventeenth century. It is not improbable, however, that some, at least, of the shells, may have been preserved and handed down from one generation to another as *great medicines*. One example which I have examined, found lying at the head of a skeleton in an Indian grave on Georgian Bay, has the upper whorles removed, so as to expose the internal canal. Five lines, or notches, are cut on the inner face of the canal, and it is perforated on the opposite edge, showing in all probability where the wampum, scalp-lock, or other special decoration of its owner was attached. It also exhibits abundant traces of its long and frequent use. The surface is smooth and polished, as if by constant handling, except where it is worn off, or decayed, so as to expose the rough inner laminæ of the shell: and all the natural prominences are worn nearly flat by frequent attrition. The specimen in the collection of the Canadian Institute, brought from the fishing islands on Lake Huron, is also cut and greatly worn, and exhibits abundant traces of long exposure.

Other examples of these large tropical shells which have been found in Canada, and also in the State of New York, were probably deposited at an earlier date: but all, or nearly all, appear to have been offered as tributes in honor of the dead. The modes of sepulture of the different tribes greatly vary, and some of their rites are peculiarly characteristic, but all of them included the deposition of valued gifts, or the favorite weapons and implements of the deceased, alongside the corpse. One manner of disposing of the dead consists in placing the body on a scaffold, or raised platform, around which the last gifts and offerings are suspended, after they have been rendered unserviceable to the living by some process of injury. This constitutes the final sepulchral rite of the Chinooks, Kliketats, Cou-

litz, and all the Indians of the Columbia River. The most common and characteristic elevated bier of these western tribes is the canoe, raised on poles, and decorated with relics pertaining to the deceased; and with the offerings of his friends. These Indian biers are invariably erected on an isolated rock or island, or some equally inaccessible spot, so as to be beyond the reach of beasts of prey, and are the final resting places of the dead. Mr. Paul Kane has a highly characteristic oil painting of the cemetery of the Coulitz Indians, executed by him from sketches taken at the spot, on the Coulitz river, where these singular canoe-biers are erected on a small island. Among the Babeens this mode of scaffolding the dead is confined to females, while the males are invariably burned. But different ideas regulated the final honors paid to the dead among the eastern tribes settled around the great lakes. Among the Pottowatamays, the Menamonies, the Ottawas, the Indians of the Six Nations, and other tribes, the practice pravailed the interring their dead in large sepulchral depositories, into which the bones were promiscuously gathered, after the final honors and sacrifices had been offered to the deceased. This custom fully accounts for the large ossuaries brought to light within the original localities of these tribes; and as the custom of depositing the favourite weapons and implements of the deceased along side of him, is common to nearly all savage people, and appears to have been universal among the Indians of the new world, this shews the origin of the interesting objects of native art which many of these cemeteries have disclosed.

About the year 1837, one of a class of extensive ossuaries, which have furnished many relics pertaining to the period of ancient Indian occupation of the Canadian clearings, was accidentally discovered in the township of Beverly, twelve miles from Dundas. An elevated ridge, running from north to south, is covered by an old growth of full-grown beech trees, standing somewhat widely apart; and across this, and consequently running from east to west, a series of deposits of human bones were exposed, ten or eleven of which were opened. They contained an immense number of bones, of both sexes and of all ages, promiscuously heaped together, and interspersed with many Indian relics, which furnished the chief temptation to their exploration; and from their extent and the evidence they disclosed of repeated interments, they undoubtedly indicated a permanent location of the tribe, of which so many members had there

found their last resting place. One of these remarkable sepulchral depositories which was carefully explored, was found to measure forty feet in length, with a breadth of eight feet; and throughout this entire area it consisted, to a depth of six feet, of a solid mass of human crania and bones. Along with numerous specimens of clay pipes, beads, amulets of red pipe stone, copper bracelets, and personal ornaments of different kinds, obtained from those Beverly ossuaries, there were found various shell-beads, a worked gorget made from a large sea-shell, with the original nacre of red not entirely gone, and two entire specimens of the large tropical sea-shells already referred to. One of these furnishes another specimen of the *pyrula perversa*, and the other is described by Mr. Schoolcraft, as the *pyrula spirata*, a shell said to be peculiar to the western coasts of Central and South America. The beads found along with these tropical univalves, and made apparently from others of the like kind, appear to have corresponded to those of a remarkable southern discovery in the Grave Creek mound, Virginia, described by Mr. Schoolcraft in the Transactions of the American Ethnological Society.

The interest which pertains to such Indian relics, manifestly depends on the fact of thus discovering along the shores of our great inland chain of fresh-water lakes, specimens of the large sea-shells of the Atlantic and Pacific Coasts of Central America, and of the West Indian Isles. The attractions offered by this and other allied species of the large and beautiful tropical shells are sufficiently apparent, and, as we have seen, are by no means limited to the untutored tastes of the American Indian, nor to the products of the Mexican coasts. Their employment in the construction of vessels for ordinary use has already been referred to; but other and more important applications of some of them to special and sacred uses among the inhabitants of the old world seem to offer illustrations more in accordance with the discoveries here referred to. In India, China, and Siam, this is especially the case. There the *Pyrum*, and others of the large and beautiful shells of the Indian Ocean, of the species *Turbinella*, are highly prized by the natives of the neighbouring districts; and this is especially the case with a sinistrorsal variety found on the coasts of Tranquebar and Ceylon, and made use of by the Cingalese in some of their most sacred rites.

The greater number of the genus *Pyrula*, are dextrorsal, or rise in a spiral line from right to left, so as to present the mouth on the right side when held with the elongated canal or tube downward. Such is not the case, however, with the two species referred to as belonging to the American continent, and hence apparently the origin of the name given to the more abundant of these, the *Pyrula Perversa*. But in the East Indian Seas, examples of sinistrorsal monstrosities of the native species are occasionally met with, and are highly prized. Such reversed shells of the species *Turbinella*, are held in special veneration in China, where great prices are given for them. They are kept in the pagodas by the priests, and are not only employed by them on certain special occasions as the sacred vessels from which they administer medicine to the sick; but it is in one of those sinistrorsal turbinellæ that the consecrated oil is kept, with which the Emperor is anointed at his coronation. It is probably in reference to this custom that Meuschen, who considered what is now recognised as the full grown shell a different variety from the smaller one,—called by him the *Murex Pyrum*,—gave to it the name of *Murex Sacrificator*.

These shells are often curiously ornamented with elaborate carvings, fine specimens of which are preserved in the British Museum. In the Synopsis of the Zoological Galleries in that Museum, it is remarked, "The *Turbinellæ* from their form have been called turnip shells, or rape shells. These are often used as oil vessels in the Indian temples, and for this purpose are carved and otherwise ornamented, as may be seen by some in the collection. When reversed, they are much sought for by the Ceylonese, and highly valued; one of these reversed clamp shells is in this collection. They are said to sell for a very large price in Ceylon and China."

The *Turbinella Pyrum*, which is one of the most prized of these Ceylonese *Turbinellæ*, is also an article of great importance in the ornamental manufactures of the East Indies, and is so extensively employed that upwards of 4,300,000 shells have been exported in a single year, from Ceylon to the ports of Calcutta and Madras. These are chiefly employed in the manufacture of armlets, and anklets, often highly ornamented, and generally known by the name of *bangles*. The process at the apex of each shell is also made into a button or bead. These are the *Krantahs*, necklaces of which have been so commonly worn by the Sepoys in the East India Company's service, as almost to be deemed a regular part of their uniform.

Some of these personal ornaments of the modern Hindoo, manufactured from the solid porcellaneous *pyrum*, closely correspond to the relics of similar construction found in ancient American grave mounds, and supposed by their first discoverers to be wrought in ivory. The chief value of the latter, however, arises from their discovery in latitudes altogether remote from the native habitat of the living mollusk, and the consequent traces which they disclose of ancient migration, or of trade and traffic between widely severed tribes of the American continent. While the tropical shells thus met with in the regions of the Great Lakes may be assumed to represent one among the prized treasures of southern latitudes, the north had its coveted mineral wealth, of the diffusion of which throughout the whole tribes of the northern continent we have abundant evidence from various sources, and referring to very different periods. Among the relics entombed in the sacrificial mounds of the Mississippi valley have been found objects formed from the mica of the Alleghanies, and the native copper of Lake Superior, mingling with others modelled from the tropical fauna of the southern continent.

It is in the western region of the great lakes that the mineral treasure are found which attracted the attention of the Indians long before the discovery of this continent by Columbus or Cabot, and, in that prehistoric period of America, furnished the chief element of traffic, and the source of intercourse between the north and south. The traces of mining operations afford abundant proof of the working of the copper by the Indians of Lake Superior, without any skill in the metallurgic arts, and indeed without any precise distinction between the copper which they mechanically separated from its native matrix, and the unmalleable stone or flint out of which they were ordinarily accustomed to fashion their spear and arrow heads. This metal, Mr. Schoolcraft remarks, "was employed by the Indians in making various ornaments, implements, and instruments. It was used by them for arm and wrist bands, pyramidal tubes, or dress ornaments, chisels and axes; in all cases, however, having been wrought out exclusively by mere hammering, and brought to its required shape without the use of the crucible or the art of soldering. Such is the state of the manufactured article, as found in the gigantic Grave Creek mound, and in the smaller mounds of the Scioto Valley, and wherever it has been scattered, in early days, through the medium

of the ancient Indian exchanges. In every view which has been taken of the subject, the area of the basin of Lake Superior must be regarded as the chief point of this intermediate traffic in native copper. In exchange for it, and for the brown pipe-stone of the Chippewa River of the Upper Mississippi, and the blood-red pipestone of the Coteau des Prairies west of the St. Peters, they received certain admired species of sea-shells of the Floridian Coasts and West Indies, as well as some of the more elaborately and well-sculptured pipes of compact carbonate of lime, grauwacke, clay-slate, and serpentines, of which admirable specimens, in large quantities, have been found by researches made in the sacrificial mounds of the Ohio Valley, and in the ossuaries of the Lakes. The makers of these may also be supposed to have spread more northwardly the various ornamented and artistic burnt-clay pipes of ancient forms and ornaments, and the ovate and circular beads, heart-shaped pendants and ornamented gorgets, made from the conch, which have received the false name of ivory, or fine bone and horn. The direction of this native exchange of articles appears to have taken a strong current down the line of the great lakes, through Lakes Erie and Ontario, along the shores of the States of the Ohio and New York, and into the Canadas. Specimens of the blood-red pipe-stone, wrought as a neck ornament, and of the conch bead pendants and gorgets, &c., occur in the ancient Indian burial grounds, as far east as Onondaga and Oswego, in New York, and in the high country about Beverly, and the sources of the several small streams which pour their waters into Burlington Bay, on the North shores of Lake Ontario." *

The conchological relics now referred to are of peculiar value, from the illustration they afford of the area embraced by this ancient traffic between the north and south. Whatever doubt may be thrown on the derivation of the specimens of ancient native manufacture, or of the copper found in sepulchral and other deposits in the Southern States, and in Central America, no question can exist as to the tropical and marine origin of the large shells exhumed not only in the inland regions of Kentucky and Tenessee, but in the northern peninsula lying between the Ontario and Huron Lakes, or on the still remoter shores and islands of Georgian Bay, at a distance of upwards of two thousand miles from the coast of Yucatan, on the main land: the nearest point where the *pyrula perversa* is found in its native locality.

* "History, &c., of Indian Tribes," vol. i., p. 67, 68.

It is obvious from the large and cumbrous size of the American *strombi* and *pyrulæ*, that they must have possessed some peculiar value or sacredness in the estimation of the Indian of the northern regions, to encourage their transport from so great a distance, through regions beset by so many impediments to direct traffic. Their transport to Canadian Lake districts appears to have been practised from a very remote period. Mr. Schoolcraft describes specimens of the *pyrula perversa* obtained by him in these regions, in an entire state, among traces of Indian arts and customs: "deemed to be relics of the ante-Cabotian period;" and from the circumstance of their discovery in sepulchral mounds, and laid at the head of the buried chief, with his copper kettle and other peculiarly prized relics, the *pyrula* of this continent would appear to have been held in no less veneration by the natives of America, than the Asiatic species now are by the Cingalese, or the more civilized and cultivated priests of China. Their appearance when found among sepulchral deposits, as already described, exhibits abundant traces of constant handling in the uses to which they were applied. But whatever these were, we can scarcely doubt, that they were connected with Indian superstitions, and not with any purposes of mere practical utility, such as they sufficed for with the ancient inhabitants of the Antilles, and as are provided for in like manner, by means of other species of similar large shells of the Southern Ocean, among the Australian Islanders. It seems not improbable that the gigantic univalves thus brought from the Gulf of Mexico, and introduced among a people familiar only with the miniature shells of the fresh-water mollusks, owed not a little of the veneration in which they appear to have been held, to the natural wonder with which the untutored mind is apt to regard whatever greatly exceeds the scale of its ordinary knowledge. Magnitude, rarity, and difficulty of acquisition, give their chief value to many of the treasures of civilized, as well as of savage life. In all probability the *pyrulæ* thus venerated by the ancient Indians of Canada West, closely corresponded to the *Conopas*, or rude Penates of the Peruvians, as described by Rivero and Von Tschudi. Any singular or rare object in nature or art seems to have sufficed for one of these Peruvian minor deities, amulets, or charms. "Every small stone or piece of wood of singular form was worshiped as a Conopa. These private deities were buried with their owners, and generally hung to the neck of the dead."

Trifling as such relics of Indian superstion, or of the rude traffic of barbarous tribes, may appear, they are not without some value to us, both in regard to the light they throw on the ancient history of this continent, and also, perhaps, in respect to some of the forms in which the progressive civilization of its new occupants may be modified by the same physical causes which largely controlled the ancient intercourse between north and south, and between west and east.

In no respect is the continent, to which these relics pertain, more strikingly diverse from that of Europe, than in its broadly-marked physical characteristics. The greatest diameter of Europe is from east to west, so that its chief area of occupation is embraced within a nearly similar range of temperature. Yet along with this great uniformity of climate, its surface is broken up by mountain ranges, its coasts are indented by bays, estuaries, and land-locked seas, and its border tribes and nations are isolated by means of peninsulas and islands, so that, amid all the resources of modern civilization, the individuality of nations has been preserved to a remarkable degree, and we still study among its diversified populations the relics of people and languages pertaining to ante-christian centuries. Altogether different is it with the American continent, where the great levels are so little broken, that not only the boundaries of properties and townships, but even of states, provinces, and dominions, are drawn without reference to any natural features of the country, except in such cases as the great lakes, the St. Lawrence, the Rio Grande, and very partially in that of the Mississippi. The most important navigable river of Europe, moreover, flows from east to west, in one parallel of latitude, and through a population in all ages rendered somewhat homogeneous by influences of climate and all external circumstances; but the Mississippi and the Missouri together flow through 20° of latitude, with all the varieties of climate still further increased on a continent which extends its widest area within the Arctic circle, and where consequently the curves of equal temperature, in the isothermal lines drawn across the two continents, approach as much towards the equator in the meridian of Canada as they recede from it in that of the west of Europe.

Looking back into the most ancient history of Europe, we find that that continent also had its northern mineral treasures: its tin, pertaining to the Kassiterides, or British Islands, and its amber, found then as now in most abundance on the shores of the Baltic. But it was by maritime intercourse, through the agency of the Phœnician

merchantmen of Asia, that the north of Europe exchanged its mineral treasures for the coveted possessions of regions lying towards the tropics. Herodotus, in the earliest known reference to the British Isles as the source of tin, refers to them only to declare his total ignorance of them; and in noticing the rumour that amber is brought from the northern sea in which they lie, he says:—"I am not able, though paying much attention to the subject, to hear of any one that has been an eye witness that a sea exists on that side of Europe." Nor did this singular isolation, so peculiarly characteristic of Europe, disappear even in the later ages of Roman rule. Dr. Arnold, in contrasting our knowledge of the globe with the ignorance of earlier ages, remarks: "The Roman colonies along the Rhine and the Danube looked out on the country beyond those rivers as we look up at the stars, and actually see with our eyes worlds of which we know nothing."

The Indian relics now specially referred to, when considered in connexion with the copper weapons, implements and ornaments of Southern grave-mounds, appear to throw a light on the past history of the American continent in its antehistoric ages, and to show it then as now, as clearly distinct in political as in physical characteristics from ancient or modern Europe. Europe never could be for any length of time the area for a nomadic population. In America, with its great unbroken levels, even the home-loving Anglo-Saxon becomes migratory, and seems to lose in a degree his old characteristic of local attachment. In Europe the diverse ethnological elements are still kept apart by its physical features. The Iberian of Ante-Christian centuries survives in the Pyrenees, and the Gaul and Briton of the first century find still their representatives on the coasts of Brittany, and in the mountains of Wales. But an aboriginal population, marked by many nearly homogeneous characteristics, appears to have occupied the entire area of the American continent; and now when its ancient tribes are being displaced by the colonists that Spain, England and Ireland, France, Italy and Germany, Poland and Hungary, pour unceasingly on its shores: the distinctions of Iberian, German, Celt and Saxon, which have survived there for well nigh two thousand years, appear to vanish almost with the generation that sets foot on the shores of the new world. When we consider how largely all European history has been affected by the peninsular character of Greece and Italy, and by the insular character of Britain, as well as

in its modern centuries by the isolation of Spain, France, Denmark, and the Scandinavian Peninsula, we cannot fail to perceive in this a key to some of the contrasting elements of fusion already noticeable among the people of European descent throughout the American continent. May we not further draw from this important inferences as to the causes of those homogeneous characteristics noticeable among the whole aboriginal tribes of the new world, to which an undue importance has been attached by American ethnologists, from their supposed bearing on the great question of human origin and descent from one or more centres of creation.

ON THE RELATION OF QUANTITY TO THE ÆSTHETIC SENTIMENT.

BY THE REV. DAVID INGLIS, M.A.

Read before the Canadian Institute, March 6th, 1858.

In compliance with the invitation of the Council for communications from the members at large, I venture to submit to the Canadian Institute a few remarks on the relation of Quantity to the Æsthetic Sentiment, drawing the illustrations mainly from the vegetable kingdom; chiefly with the view of inviting our consideration to a subject which has recently rewarded the study of scientific observers by results of great interest and value.

Numbers have a wondrous significance in every department of nature; and though the sensation of beauty may be without effort on our part, nevertheless the element of numbers enters largely into those arrangements, recurrences, and proportions which are so essential to all the forms that beauty loves. The eye is delighted with the foliage of one of our forest trees, clothed in the freshness of its early summer tints. A careless gazer may see no arrangement in the tree, but a shapeless mass of umbrageous beauty. A more careful observer discovers that the several parts are disposed and arranged by certain laws serving special ends, and that the forms, colors, and numbers are all designed and adjusted upon great and wise principles.

Such a discovery enhances our admiration, and leads us forward in the study of the wondrous works of God:

"With growing strength and ever new delight."

The number two is the most apparent cipher in the whole range of figures. All things go in pairs, and those two are ever one. The one is nothing without the other. You cannot separate them without destroying both. Thus we have day and night. But suppose that the earth did not turn upon its own axis, so that one hemisphere basked in the continual light of the sun, and the other lay in the gloom of an unbroken darkness. To the inhabitants of the first, no conception of day would be possible; neither would that of night be possible to the dwellers on the shadowed side. So every where we have male and female, cold and heat, negative and positive, and numberless instances of this duality. In the structure of plants we find each to be a dual, composed of two essential and distinct parts—the stem and the leaf. Whatever apparently diversified forms may be found in the plant, they may be all reduced to these two. The sepal is a rudimentary leaf. The petal is a leaf reduced in size, thinned, and coloured. The stamen is a leaf whose peteole is represented by the filament; while the two sides of its laminæ are represented by the two lobes of the anther. In like manner each flower itself is a rudimentary branch, with its penduncle and bracteoles. The plant, therefore, is a dual, with unity of plan running through the whole.

We have said that these two are ever one. It would have been more correct to have said that that these two are ever three; for, after all, the universal quantity is a triad rather than either a unit or a dual. To the senses, the constitution of things is twofold; but to the reason it is threefold. Between the two points already stated there is ever a third or middle point, without which we do not conceive accurately of either. Thus we have male and female, and that middle or third term, man, in which the two are one. So also we have the negative and the positive, and the relation between these opposites. We have the outside and the inside, and that one thing of which we use these relative terms. We have, also, stem and leaf, and the plant of which these are the essential parts.

Following *three* we have *five* as the next great typical number; and next to this, and the last of the great and universal numbers, is *seven*. Carry our investigation where we will, these numbers follow each other in numerical progression. But our observations must for the present be confined to the vegetable kingdom.

In the acotyledons, or acrogenous classes of plants, *two* is the typical number. In lichens, ferns, and the like, two and its multiples prevail. Thus in the order Equisetaceæ, the branches, sheaths, and furrows are found in the numbers 2, 4, 8, &c.; and this is still more remarkable in the crowded teeth which fill the sheaths, and which are always found in multiples of two. So also in the order of mosses, we have teeth in the following numbers, 4, 8, 16, 32, and, in one instance (polytrichum), we have 64.

In the next class, the monocotyledons, as seeds, grasses, and other seed-bearing plants, we find *three* to be the prevailing number. That three and its multiples here prevail, is sufficiently illustrated by the use of such terms as Tricandria, Trigynia, Hexandria, &c., in describing the different orders of plants in this class.

In the dicotyledons, or highest order of plants, we have *five* as the typical number. Of this class the oak, with its acorn, may be taken as the great British type. Here may be observed five leaflets on a common stalk: the flower stem has five primary branches; these in turn have five secondary; and so repeatedly. The articulated leaves of this order are divided into five parts, and the stamens are in multiples of five.

Seven is found only in the class Heptandria, of which the horse-chestnut may be taken as the example. In the British Flora, there is only one plant belonging to this class—the Trientalis Europea, or chick-weed (winter-green.) But this number, so rarely found in the vegetable kingdom, is the great typical number in other departments of nature.

We find a numerical relation of a deeply interesting kind running through the various parts of the plant. This relation is most apparent when we examine the various parts of a complete flower. Thus in the flower of the monocotyledon, where three is the prevailing number; in it the outer row represents the calyx, with three sepals; the second row the corolla, with three petals; the third row represents the stamens, of which there are six—two rows of three each; and in the centre there are three pistils united in one. So also in the flower of the diocotyledon we have in the outer row five sepals; in the second, five petals; in the third, five stamens; and in the centre, five pistils.

If we compare the structure of the whole plant with that of the leaf, we find a striking correspondence both as to disposition and

numbers. In trees such as the birch, we have one main trunk sending out branches at equal distances; and each side branch, in its turn, becomes a central axis, sending out comparatively small branches. Examine the leaf, and we shall find one central vein sending out its veins on either side; and these, in like manner, sending out other smaller veins at equal distances. In trees such as the sycamore, we see more clearly the relation of numbers to this arrangement. The sycamore, at the height of eight or ten feet, sends out all at once a cluster of five branches; and in correspondence with this, its long leaf is divided into five mid-veins. The horse-chestnut sends forth, from the top of a bare trunk, seven branches, and the leaf is divided in exact correspondence with this. So in herbaceous plants: we find triplet stalks corresponding with triplet leaves.

In the arrangement of the leafy appendages of plants, there occurs a curious series of numbers: 1, 2, 3, 5, 8, 13, 21, 34, 55, &c. Here it will be observed that any two numbers of the series give the succeeding one. Of this arrangement, the cone of the fir-tree furnishes the most apparent illustration. In the cone we have a well-defined spiral arrangement, by which the scales are arranged round its axis. We take its most common form, in which two of these spirals are visible; though in reality there are four spirals—the governing one, by which the scales are arranged round the axis, and one other running in the same direction, and two others running in the opposite direction. The two sets of visible spirals intersecting each other form a series of figures, consisting of two equilateral triangles on the surface of the cone. These diamond-shaped figures have definite angles. Those above and below approximate to 120°; those on the sides to 60°. These well-defined and beautifully proportioned rhomboidal figures on the surface, give to the cone its peculiar beauty and harmony of shape. This arrangement also necessitates a series of figures spread over the surface of the cone: one of the rhomboidal protuberances occupies the centre, with four others corresponding—one at each angle: these give the figure known in gardening as the "quincunx."

In the spirals themselves we have a definite and special arrangement of numbers. They are, as we have seen, in two sets: one running from right to left, the other from left to right. The parts or numbers of each set, seen in the section of a cone—which Dr. McCosh has called threads—are arranged in numbers corresponding

with the progressive series already noticed: 1, 2, 3, 5, 8, &c. But the number of threads in one set of spirals, say that running from right to left, differs from that of the other running from left to right, yet the two stand in a remarkable relation, for the number in the second set is always one or other of the two contiguous ones in the above scale. If the number in the first be 5, then that in the other will be either 3 or 8. If the one be 13, the other will be 8 or 21, &c.

We have taken the cone of the fir as an illustration of this spiral and numerical arrangement, because this is one of the instances in which it is most apparent; but it has been conclusively shown that the same spiral arrangement regulates all the leafy appendages of the stem, and with the same results as to numbers.

These facts might be used with great effect to show the evidences of order and design, and of wisdom, and power in creation; but I propose to use them for the present for quite another purpose, though leading to the same conclusion of adoring views of God, who in lofty wisdom planned all things in the beginning, and with special care adapted all things to specified ends. We need not enter into the discussion of what beauty consists in; but appealing to the universal sensation of pleasure with which the eye reposes upon the outlines of beautiful forms, and the orders and variety of arrangements, I would briefly point out the special connection of the phenomena of beauty with the laws of quantity above stated. Whence arises that harmony of visual effect that strikes us in the wildest natural landscape as compared with the effect of an artificial plantation? Not from the harmony of colours, for this you may find in the artificial plantation as well as in the natural landscape. Not from the absence of regularity, for whatever is irregular throughout produces the feeling of deformity rather than of beauty. There is regularity in every form, yet not that regularity which impresses the mind simply with a sense of mechanism. Every where you have rectilinear figures, but these in connection with manifold curvilinear combinations, as in the case of the fir cone already noticed. In each form we have a regular law of numbers regulating all the appendages of the stem and influencing its waving outline. No where is there sameness. Every where is there regularity. From the leaves of the overhanging giant of the forest, down to the minute petals of the fringed daisy, every proportion and recurrence is specifically arranged, and admits of an arithmetical or mathematical expression.

While we observe all this in the forms of nature, it is not less interesting to turn the thought inward and mark the delight which the mind takes in numerical repetitions and recurrences—such delight as is felt in rhyme, and in music. These co-relations in poetry and music appeal to the same faculty of the mind which delights in the discovery of correspondences and proportions among the objects of nature. So that the man of judicious and deliberate research finds in the living garment with which God has clothed this wondrous world, a poem rich in the most beautiful analogies, a piece of music full of the most glorious harmonies.

"———The well directed sight
Brings, in each flower, a universe to light."

The student who will study the structure of plants with a view to these numerical relations and adaptations, may add no new names to the list of Flora, but he will reap a rich harvest of profitable knowledge, and will be led more and more to magnify the Lord with "the duty of a devout and learned admiration."

"———Thy desire, which tends to know
The works of God, thereby to glorify
The great workmaster, leads to no excess
That reaches blame, but rather merits praise
The more it seems excess. * *
* * * * * * *
For wonderful indeed are all his works,
Pleasant to know, and worthiest to be all
Had in remembrance, always with delight."

ICE PHENOMENA, FROM OBSERVATIONS ON RICE LAKE.

BY J. H. DUMBLE, C. E.,
ENGINEER OF THE COBOURG AND PETERBOROUGH RAILWAY.

The phenomena attending ice are, I believe, but little understood or investigated in Canada. That water increases in bulk during the process of crystalization is well known. The mere facts, that ice floats on water, and that vessels of any description which contain water fracture while it is congealing, are proofs sufficiently practical. But that ice itself should be capable of expanding and increasing in bulk is not equally well known, although many practical proofs are afforded.

This property of expansion and contraction of ice aids in fracturing and reducing the floating and gigantic iceberg; and Dr. Kane tells us, that but for changes of ice at temperatures *far below the freezing point*, causing pressure, collapse, fracture and disruption, the short Arctic summer would fail to open the Arctic Seas. I may add, that the ignorance, or want of a proper appreciation, of the properties of ice, evinced in the construction of numerous wharves, piers, and bridges on the inland lakes and rivers of Canada and the northern States, has proved a source of infinite annoyance and of immense expense.

The Cobourg and Peterborough Railway bridge across Rice Lake supplies a remarkable instance, from observations of the effects of ice on which some valuable practical conclusions may be deduced. Timber being plentiful along the shores of this lake, a cheap and substantial form of pile and truss bridge was constructed.

This bridge on more southern waters would doubtless have been considered a most suitable structure, but owing to the violent and almost irresistible force of ice, while expanding, a considerable portion of this structure now presents the appearance of a complete wreck. Having, as Engineer of the Cobourg and Peterborough Railway, had two winters' experience of ice phenomena on Rice Lake, and having carefully noticed the peculiar circumstances attending the various movements of the ice, I submit my observations and remarks, hoping that from them a somewhat satisfactory and perhaps correct theory may be deduced.

In the first place, it is well to know, that the violent movement of the ice on Rice Lake is that of contraction and expansion, caused entirely by *change of temperature*. The lake generally "takes" with ice during the month of December at a pretty high water level, which level the dam across the outlet preserves until spring. Currents, therefore, cannot be said (as in the case of rivers) to influence the movements of the ice. Neither have we on Rice Lake those other various causes, such as differing temperatures of ice and sea water, currents, or wave action, which produce the disruptions of Arctic ice. It is observed on Rice Lake that the action of the mid-day sun will set the *glare ice* immediately in motion. Warm winds, snow storms, and rains, do likewise produce the same effect, when the ice is glare and free from water or snow. This motion is generally quite perceptible; it is not shrinkage, or contraction, but on the contrary is a

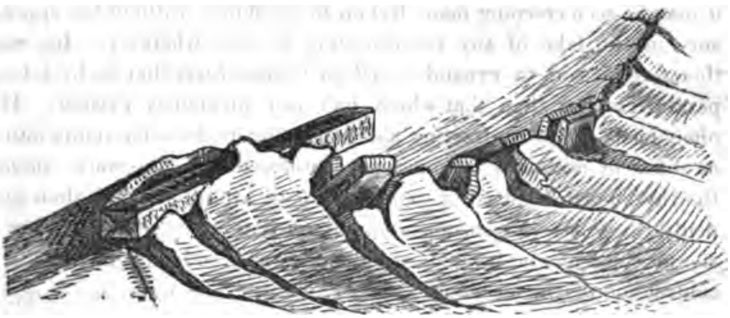
visible stretching and expanding of the field-ice, generally towards the shores of the lake and of islands. The movement of the ice is at times very gradual, and is accompanied by a slight crackling noise. Again the expansion is rapid and violent, the movement being by a succession of vigorous jerks accompanied by a hollow rumbling sound, seemingly from under the field-ice, while at intervals there occur sharp loud reports like that of cannon.

That ice does *expand* under such circumstances is very evident, as it may be seen creeping many feet on to the shores, without the appearance in the lake of any compensating fissures whatever. Ice may therefore be said to expand by a *high temperature*, that is, by a temperature higher than that which had just previously existed. The phenomena of ice contracting and expanding at the same temperature on different occasions is sometimes witnessed. For instance, should the thermometer indicate a temperature of minus 30° and then suddenly rise to zero, expansion would immediately be the result; again, should the temperature indicate plus 30° and suddenly fall to zero, contraction of the ice would speedily follow. The force and violence with which ice expands or shoves depends entirely on the *extent* of the *change* of temperature. The most violent shoves of ice occur previous to rain storms. A rise in temperature of 20° or upwards produces violent expansion. Various instances may be cited of the effects produced by ice when expanding; evidence of its power is very indelibly written on parts of the Railway Bridge before mentioned. Portions of this structure on piles have been, for long distances, bent and inclined even to an angle of 45° in a most uniform and extraordinary manner. Strong oak piles that would not bend have been cracked

and splintered, hundreds of heavy cap timbers of sound pine have been snapped across like reeds, and heavy iron rails have been curved and doubled up, by the almost irresistible pressure of the ice.

Instances of trees growing on the shores having been torn up by the roots are of frequent occurrence. Large boulders, weighing two tons or more, have been lifted several feet from the shore, and then pressed into the timbers forming the abutments of the bridge: as shown in the preceding illustration, sketched on the spot.

Channels cut for the purpose of moving timber frequently close by the expansion of the field ice, and the timbers are heaved out high and dry.



The greatest amount of expansion that I have witnessed at any one time in a horizontal direction was six feet. This may be considered a maximum shove.

When ice shoves on to the shores of lakes or islands it presents different forms of fracture, according to the nature of the resistance it meets with. Should the shore be low the ice merely runs up and fractures at the ripple mark. On the contrary, should the ice meet with resistance from a vertical shore or pier, a bursting up and piling of the fractured pieces would be the result.

Ice when contracting presents precisely the reverse of this fractured appearance. From my experience of ice I believe it is susceptible of contraction, but to a very limited extent. I have witnessed many sudden changes of temperature on Rice Lake, in some instances from plus 30° to minus 20°, indicating a fall of some 50°; and yet the contraction of the ice, as made visible by open fissures, has not exceeded three inches.

I have repeatedly heard of openings, that have occurred during former years, of several feet in width. I am inclined, however, to believe, that the distinction between a shove and an open crack, or fissure, was not sufficiently understood by my informants.

I have witnessed in several shoves that when the ice contracted, the fractured and elevated pieces, which previously came in contact with each other, would fall, and perhaps partly under the field ice. A space in the centre thus presented open water. This open water has probably been mistaken for a fissure caused by contraction.

I have heard of open fissures that have been seen eighteen inches in width, and this I think under peculiar circumstances, quite probable. That these fissures do sometimes occur, and that they never do occur unless the thermometer indicates a decided fall of temperature, is sufficient proof that ice contracts by a change to a temperature lower than that which had just previously existed. I may add, that contraction occurs generally at night, and is accompanied by sharp reports. A uniform temperature of the atmosphere does not cause either expansion or contraction of ice; it matters not whether the temperature be high or low, no movement of any kind takes place. A coating of snow of any depth over six inches effectually prevents any motion in ice, by protecting it from the influences of the atmosphere.

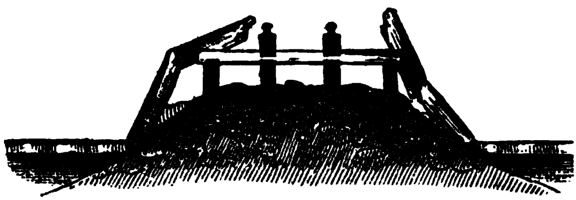
I find from repeated experiment that the upper stratum of ice partakes of the temperature of the atmosphere (up to 32°). The lower stratum maintains a constant temperature of some eight degrees below that of the underlying water. A fall of temperature, therefore, affects only the upper stratum, while the lower stratum remains unaffected. A separating and fracturing of the mass at its weakest point must of course be the result. Just the contrary effect is produced when the upper stratum is affected by a high temperature; shoving and overlapping is the consequence.

Ice, unlike most other solids, does not seem to possess the property of contraction to the same extent as it does the power of expansion. This will seem apparent from the following evidence:—When ice ex-

pands, and is forced perhaps six feet on to the shore, it is observed that should the temperature again fall, this ice, which had previously exceeded its limits does not recede to its former position, neither will the main field separate over a few inches from the fractured portions on the shore. On the contrary, should the temperature again suddenly rise a still further advance of perhaps the same distance is made on to the shore.

This repeated expansion may occur many times during a winter, and yet little evidence of any contraction will appear. I have known channels some six feet in width, opened for the purpose of isolating the Rice Lake bridge, to be closed eight times within a month by the expansion of the field ice.

An extraordinary instance of ice piling was witnessed on our new embankment. The ice shoved from both sides until the fractured pieces met in the centre of the track. The embankment is twenty-six feet in width at water level, and the rail is some six feet elevated; as shewn in the accompanying section.



The next phenomenon of ice, and that which seemed the most perplexing and difficult to account for, is the fact of ice shoving from different directions at different periods. In the first place it was noticed that it rarely or never shoved or fractured towards the centre of the lake; but on the contrary, the ice on the shores of the lake and of islands exhibited unmistakable signs of commotion.

It is but reasonable to suppose that any solid, equally dense throughout its dimensions, and susceptible of expansion, would, when equally acted upon by the active agent or moving cause, expand from its centre towards its circumference. We find such is the effect produced on any large field of ice of equal thickness and density, when acted upon uniformly by either the mid-day sun or warm winds. It is a fact, however, that it moves from other directions than from the centre of the lake. Shoves are sometimes witnessed from the east and sometimes from the west, to the north and to the south.

This phenomenon seemed as if it would baffle investigation, and it was only by careful observation of all the circumstances attending the formation and movements of the ice that I could deduce a theory to my satisfaction. It would perhaps be well to describe that portion of Rice Lake which came within my observation. The railway bridge crosses the lake at its widest part. An island, containing some three acres of land, is situated on the line of the bridge, about three-fourths of a mile from the south shore. The bridge is formed of pile bents, with the exception of that portion immediately to the north of Tic Island, which is a continuous truss for half a mile. To the east is a wide and unobstructed expanse of water; at the distance of perhaps four miles from the bridge, the lake is narrowed by two promontories to a mile in width. Less than a mile to the westward a succession of beautiful islands rise from the lake. The Otonabee River, a large sluggish stream, enters the lake opposite those islands from the north. We have then at this particular part of the lake some twelve square miles of water-way. When this large space is therefore covered with glare ice, and is swept by warm winds after a previous low temperature, the amount and force of its expansion is somewhat surprising.

An instance of expansion from the centre of this large field may be cited:—In December, 1857, the lake was covered with dense glare ice five inches in thickness. The temperature was extremely low (ranging from minus 10° to minus 30°) for some time after the ice formed, it suddenly rose to plus 30° previous to rain. The expansion that followed was of the most violent description. The truss bridge superstructure moved two feet six inches on to Tic Island; the pile bridge south of the island was forced four feet and a half on to the south shore. The bridge was slightly shoved to the north, but was mainly preserved by the parallel channels that happened to be open for the purpose of isolating it in that direction. The centre of the bridge was not affected in the slightest, it being the neutral point. The ice was piled on to Tic Island from the north, east and west, but on the south side it was torn away from the shore, exhibiting a fissure or opening some twenty inches in width.

Instances of the ice shoving on to the north and south shores of the lake, and also on to the shores of islands at the same time, are frequent. In fact, when the ice is equally dense and glare, and being fairly acted upon by a warm atmosphere, it must naturally expand from its centre to its circumference. But ice, owing to the peculiar circum-

stances under which it sometimes forms, is not found to be equally pure or dense, neither is it of uniform thickness. This ice irregularly acted upon by warm winds, or by the slanting rays of the sun at different altitudes, shoves or expands from various directions other than from the centre of the lake. During the early part of the last winter the ice shoves were entirely from the east, in the vicinity of the bridge. Upon an examination of the ice, I found that to the eastward glare and dense, the ice to the west of the bridge was not so pure but was seemingly thicker and more porous. This difference in its character was owing to snow having fallen during its formation; the bridge had retained the snow to the westward, and it became incorporated with the new ice. The large open expanse to the east was constantly swept by the wind. The glare ice became the most dense during cold weather, and of course the most susceptible of expansion by heat. Consequently the shoving was (until subsequent rains had changed the relative character of the ice) from the stronger and most susceptible ice towards the weaker and less expansive.

Ice on any large and irregular sheet of water studded with islands, like Rice Lake, must naturally be of unequal thickness and density. I have therefore no doubt whatever, that the phenomenon of ice expanding and shoving from various directions is caused by the *unequal thickness, density* and *glareness of the ice,* and likewise by the *manner* in which the *heated atmosphere strikes it.*

The fact that channels opened in the lake (no matter whether transversely or longitudinally) always close up on the ice exhibiting the slightest tendency to expansion, is another proof that ice invariably expands and shoves to the line of such least resistance, and under peculiar circumstances from a general centre of the field.

On mentioning these circumstances to a friend from Kingston he asked: "If ice moves from the centre of the mass, why is it, that it does not do so between Kingston and Wolf Island?" and stated, that on the contrary a longitudinal shove and fracture are generally witnessed in the middle of the stream. I replied that the centre of the stream was generally the last to take, and being consequently the weaker ice, was sure to be crushed and fractured by the stronger ice on each side while expanding. I heard a seaman state, that he discovered the channel of a harbour (formed by the entrance of a river into the Black Sea) by the appearance of an irregular line of fracture in the ice.

Another instance of ice expanding towards the line of least resistance may be cited:—When Presque Isle Harbour is entirely frozen over, any expansion of the ice is apparent by its encroachment on the shore. But when the bay is but partially frozen over the expansion is towards the open water, and is not visible on the shores.

In conclusion, I would mention another circumstance that occurs during the expansion of ice. It is observed, that when a large extent of field ice expands towards the shore it does not shove into deep bays but fractures from point to point, in a zig-zag manner, across the chord at the mouth. The thrust of the main field must find less resistance across this chord than around the area of the bay.

Ice is a most delicate thermometer, and from the brief statement of facts connected with its phenomena the following general inferences may be derived:

1st. That ice is capable of expansion and contraction.

2nd. That ice (up to 32°) expands with a temperature *higher* than that which *had just previously* existed.

3rd. That ice contracts with a temperature lower than that which had just previously existed.

4th. That ice does not expand or contract with a uniform temperature.

5th. That ice is susceptible of expansion to a much greater extent than of contraction.

6th. That when ice is equally dense, thick, and glare, and equally acted on by a heated atmosphere, it expands from the centre towards the circumference.

7th. That ice expands towards the line *of least resistance.*

THE APPLICABILITY OF OUR EDUCATIONAL SYSTEM TO THE SOCIAL CONDITION OF LARGE CITIES.

BY THOMAS HENNING.

Read before the Canadian Institute, 27th March, 1858.

Education is a subject so fraught with interest and of such vital importance to the well-being of society, as to justify any inquiry likely

to promote its efficiency, and especially its extension to the lowest classes in the social scale. The aims and ends of education, though manifold and various, may be summed up in this expression, the "formation of character." Education is the "cultivation, training and discipline of every faculty of the intellect, and every affection and disposition of the moral and religious nature, for the attainment and fulfilment of the great purposes for which existence was conferred." If then, in the case of the individual, any faculty or power, intellectual or moral, be left undeveloped, in so far will he be incapacitated for rightly discharging the duties devolving upon him as a rational and intelligent being, and necessarily fail to attain the "purposes of his existence." An ignorant and uncultivated man forms, it has been very justly remarked, "a broken link in the chain of society, a jarring chord in the harmony of life." Every child, therefore, born into the world has a *right*, by the very laws of its existence, to such an education as will fit it for the due performance of its individual and relative duties, and no parent can deprive his child of such right without inflicting on him a serious injury, and doing a grievous wrong to society. "A parent has no more right," to use the forcible language of the Chief Superintendent of Education, "to leave his children intellectually blind, than he has to make them physically blind. He has no more right to leave them intellectually neglected than he has to maim them physically. The law will punish him in the one case, and it *should* punish him in the other. If a parent be so unnatural as not to provide for his children, the law will step in and protect them. So should it in like manner snatch those orphan children from the grasp of parents who would neglect their education. The Province has thus far a right to protect all its citizens, and if it has a right to protect life and liberty and property, it has a right to provide for the education and the efficient discharge of duty on the part of those not properly cared for by their parents." The soundness of the principle here enunciated, few, we imagine, would venture to impugn. Let us now see how Dr. Ryerson connects with this the principle of Free Schools. "The education of a people," he adds in the speech from which I have just quoted, "under a free government is essential to the very existence of that government, the wise administration of its laws, and the stability and efficiency of all its institutions. If that be so, a corresponding duty necessarily follows. If it be right that each child should have an education that will fit him for the efficient discharge

of all his duties, it is the duty of the State to provide that education. And according to the property which a man enjoys and the protection afforded to that property by the State, is he, whether he has children or not, bound to contribute to the education of the children of the State, upon the grounds of public policy, morality, and the laws which regulate property. No police system, however well organized, is equal to that of a thoroughly efficient general public school system. The application of these two principles involves the whole mystery of what is called Free Schools. It is palpable to every person who reflects upon it that this system involves principles of the highest humanity, as well as of the noblest patriotism." This, then, is the system of Education adopted in Upper Canada, a system based upon the principle "that the property of all shall be taxed by the majority for the education of all." Each municipality, it is true, may, according to the terms of the school law, either impose a rate-bill or declare the schools entirely free; still, we imagine, to test to the utmost the success of the system would require the general adoption of the free system as opposed to the imposition of rates. What then have been the results of the free system in those countries in which it has been tried for many years? How does it work in Canada? Does it accomplish both in extent and degree that which its advocates hoped and anticipated, or has it defects, inherent or accidental, which render it partially if not wholly a failure; and if so, what are these? Do they admit of removal, or are they such as to demand a radical change in the system? These are great and highly important questions, to which various answers have been given according to the prejudices and habits of the respondents, as well as their religious and political associations. My object, however, is simply to inquire as to how far the free system, under the present state of our municipal law, secures the attendance at school of those for whom it is specially designed; and whether, seeing the intimate connexion there is between ignorance and crime, it is not the duty of the State to declare both ignorance and vagrancy criminal, and to empower municipalities that tax all for the education of all to see that all are really educated.

In examining this point statistics must, in some measure, be our guide. What say they, then, respecting the state of education in large cities generally, what is their evidence specially as regards the City of Toronto? The following is a comparative statement of the schools, under specific headings, from 1844 to 1857 inclusive, prepared by Mr. Geo. A. Barber, the Local Superintendent of Schools:

Year.	City Population.	Average days attendance.	No. of Teachers.	Total Cost of maintaining Schools.	Children of School Age.
				£	
1844	18500	1194	12	4½ months 1877	
1845	19706	1108	12	1921	
1846	20565	1221	15	2011	4450
1847	No census.	1256	13	1871	
1848	23503	1431	13	Half-year 971	
1849	24126	1225	18	do 917	6149
1850	25766	1259	15	1998	6750
1851	30763	1366	16	2406	7773
1852	35000	1346	16	2558	7805
1853	40000	1402	20	3215	9000
1854	No census.	1459	21	4176	
1855	No census.	1570	31	5218	
1856	41760	1747	32	5642	8984
1857	45000	1863	36	6054	9000

From 1844 to 1847 the City was divided into School Sections, each having its own Trustees. In 1848, '49, '50 the Schools were under the direction of a Board nominated by the City Council, and in 1851 the elective principle came into operation. In 1848 and '49 the schools were free, because from a defect in the law it was doubtful whether a rate-bill could be enforced; in 1850 the rate-bill was in force, and in 1851 the free school system was established and has continued ever since. From 1844 to December 1851 there was no distinction of denominations in the schools, but from 1852 downwards separate schools have existed. In 1857 the whole number registered as in attendance, for any time in our common schools was 4,543, at the Roman Catholic Separate Schools 1,431, at the Upper Canada College 280, Toronto Grammar School 120, the Model Schools 420, and perhaps at the different private schools there may have been 200 additional, making a total in round numbers of 7,000 children, who enjoyed for a longer or shorter period the benefit of a school education in the City of Toronto. By the census of 1856, the number of young persons in the City between the ages of 5 and 16 is said to be 8,984 in that year. Allowing for the usual per centage of annual increase, I think we may fairly assume the school population of Toronto and those "due at school" to be at the present time 9,000. Taking this number and deducting the 7,000 presumed to be receiving education, we have a balance of no fewer than 2,000, a large proportion of whom are fast ripening for becoming inmates of our jails and penitentiaries.

Now although these figures may not be quite accurate, still it is certain that the number of children who are growing up in this city, and who take no advantage of the opportunities of acquiring a sound and useful education which are placed within their reach, is such as to justify earnest consideration and instant action. We have school houses externally beautiful, and fitted up internally with every convenience and appliance, we have a most respectable staff of teachers, and a system of education to which, it is true, objections have been raised, but in whose favor, we have the testimony of some of the most eminent men both in the United States and in Great Britain. In a debate which took place only a few weeks ago in the British House of Commons on the subject of national education, our Canadian system was referred to by the most distinguished men on both sides as one not only excellent in itself, but which it would be most desirable to copy in England. Why, then, it may be asked, do so many stand aloof from our schools; and why are so many growing up in ignorance and vagrancy, inflicting upon society most serious injury and heavy expenditure? To answer this question fully would lead me beyond the point to which at present I wish, as far as possible, to confine myself. I cannot but say, however, that while much is attributable to the indifference of parents for the welfare of their children, as well as to the want of countenance and moral support on the part of the more influential classes, much more injury is done by the misrepresentations of advocates of sectarian education, both Roman Catholic and Protestant.

I admit that the Common School system as it stands at present does not necessarily ensure the attendance of all those whose education is desirable; it does not do so in Toronto, as we see; it has not done so elsewhere. In European countries where the Free School system is in operation the compulsory principle is applied, as will be seen from the following extract from Dr. Kay's work on the "Social condition and Education of the people." He says:

"In Prussia, no child, without the permission both of the civil magistrate of the town or village of which its parents are inhabitants, and also of their religious minister, can be kept from school beyond the completion of its fifth year, or afterwards discontinue its attendance on the school classes for any length of time till he has passed his fifteenth year. If the parent neither provides at home for the education of his children, nor sends them to the school, the teacher is bound to inform the religious minister of the parent; the minister then remonstrates with him; and if he still neglects to send his children, the minister is bound by law to

report him to the village committee, which has power to punish him by a fine, of from one halfpenny to sixpence a day for neglecting the first and greatest duty of every parent. * * In order, however, to ensure regular attendance, and as an assistant to the parents themselves, each teacher is furnished by the local magistrate, every year, with a list of all the children of his district, who have attained the age at which they ought to attend his classes. The list is called over every morning and every afternoon, and all absentees are marked down, so that the school committees, magistrates, and inspectors may instantly discover if the attendance of any child has been irregular.

"In Baden the parish clergy, who keep registers, have to furnish the school authorities with a list of all children whose schooling begins at the next following Easter. To this is added a list of all the children in the place not born there, drawn up by the school authorities. These lists are handed to the school masters, and one fortnight after the school opens the schoolmaster has to return to the authorities the names of such children as attend the school, as well as those of the absent children. * * Children who have private instruction, or who attend higher institutions, require a certificate from the school authorities. * * * Every week the schoolmaster is required to give to the school authorities a list of such children as have been absent without leave, or who, having absented themselves, did not satisfactorily account for their so doing, together with the number of days' absence. * * * All masters of factories, who employ children under the age of fifteen, must render periodical lists of the children employed by them; giving the names, ages, places of residence, and names of the parents of such children. * * * Perhaps of all countries Switzerland offers the most instructive lesson to any one investigating educational systems and institutions. Throughout all the cantons, with the exception of Geneva, Vallais, and three small mountain cantons on the lake of Lucerne, where the population is too scanty and too scattered to allow of the erection of many schools, education is compulsory; that is, all parents are required by law to send their children to school from the ages of six to the age of fourteen. The schoolmasters in the several communes are furnished with lists of all the children in their districts, which are called over every morning on the assembling of school; the absentees are noted, and also the reasons, if any, for their absence; these lists are regularly examined by the inspectors, who fine the parents of the absentees for each day of absence. * * *

"It ought to be remembered that these laws are enforced under the most democratic forms of government. *The people themselves require attendance at the schools, so conscious* are they of the necessity of education to the encouragement of temperance, prudence and order."

Contrasting the result of these stringent rules upon the state of society with that existing in English towns, Dr. Kay adds:

"One is astonished and delighted, in walking through the towns of the cantons I mentioned, to miss the heart-rending scenes to be met with in every English town; I mean the crowds of filthy, half-clothed children, who may be seen in the back streets of any of our towns, grovelling in the disgusting filth of the undrained pavements, listening to the lascivious songs of the tramping singers, witnessing

scenes calculated to demoralize adults, and certain to leave their impress on the susceptible minds of the young, quarreling, swearing, fighting, and in every way emulating the immorality of those who bred them. There is scarcely a town in England or Wales whose poorer streets from eight in the morning till ten at night are not full of these harrowing and disgusting scenes, which thus continually show us the real fountain head of our demoralized pauperism. In Switzerland nothing of the kind is to be seen. The children are as regularly employed in school, as their parents are in their daily occupations, and henceforward, instead of the towns continuing to be, as they are in England, and as they had hitherto been in Switzerland, the hot-beds and nurseries of irreligion, immorality, and sedition, they will only afford still more favorable opportunities than the country, of advancing the religious, moral, and social interests of the children of the poor."

In New England where the Free School system may be said to have originated, it was found necessary, in the case of large cities, to adopt what is named a "Truancy Act." This Act, which is in force, with the happiest results in Boston, Providence and other cities, presents the following features as described by Dr. Bishop who was lately Superintendent of Schools in Boston. He says:

"The territorial limits of the city are divided into three districts, and a 'Truant Officer,' so called, is appointed for each district. He is required to spend his whole time during school-hours in traversing streets, lanes, alleys and other places, in search of absentees from school. These are of several different classes. One class is composed of the children whose parents have recently moved into the city, and who being more or less indifferent to the education of their children, have neglected to find places for them at school. Whenever the truant officer finds any of these children idle in the streets of his district, he makes such inquiries of them as may be necessary to ascertain their condition. If he deems it expedient he accompanies them to their places of residence, and by conversing with their parents in kind and respectful terms, he generally succeeds in persuading them to send their children to school, without any show of his authority, which should always be kept out of sight until other means have failed, and then be exercised as a last resort.

Another class of absentees stay away from school for want of shoes, or such clothes as will enable them to make a decent appearance among the pupils at school. By patient efforts, on the part of the truant officer he can generally obtain from various sources such new or second-hand articles of wearing apparel as will keep this class of pupils respectably clad, and thus enable them to continue in school.

A third class of absentees is composed of children whose parents are so unfortunate, or idle, or vicious, as to require them to stay away from school for the purpose of gathering fragments of fuel and food for the family at home. The officer can do much in his district to diminish the number of this class of absentees, but in cases of extreme poverty the absence can not be prevented, for necessity knows no law.

The fourth and last class embraces the idle and dissolute runaways from school,

who not unfrequently absent themselves against the wishes and commands of their parents. Even such children the officer tries to win back to habits of attendance and good conduct, and is often successful. But when other means fail, he complains of the offender, who is arraigned according to law, and if found guilty is sentenced to some reformatory institution for a period varying from one to two years, where he will be instructed in the common school studies, and also taught to labor at some trade. In some cases the child is sentenced to the State Reform School during his minority, not so much to punish him as to save him from apparent ruin, and to give him an opportunity of growing up under good influence, and of becoming a good member of society."

A friend writes me to say that compulsory measures on the part of the Truant Officer are seldom required. The fact that such a power exists makes the reasonings of the Truant Officer so very *cogent* both with parents and pupils, that very rarely is anything more needed.

The number of non-attendants at the Schools in the City of New York has become so great as to arouse the citizens to see the necessity of some remedial measures. In the beginning of 1857, a special report on the subject was presented to the Board of Education, in which the chief recommendation was that existing organizations, so far as practicable should be used for lessening the "great mass of truant, vagrant, begging, and idle children." The report contains the following sentences which show what these organizations are:

Though your Committee do not believe that force is the best motive to be applied to the poor to promote education, still they would respectfully recommend a more stringent application of the Truant Law on the part of the police and magistrates of this City.

By this act, on complaint of *any citizen*, a child between the ages of seven and fourteen, found vagrant, may be taken before the police magistrate for examination; and the parent or guardian can be compelled to enter into an engagement to keep such child from vagrancy, and send him or her to school "at least four months in each year." The act provides also for the punishment of the parent if this engagement be broken. It further makes it the duty of all police officers who shall find truant and vagrant children to make complaint, as before described. If this law were at all thoroughly applied—if the existing organization were brought into coöperation with this Board—if a new series of Industrial Schools, together with visitors and appropriate ways and means, were opened—your Committee believe that a vast proportion of this vagrant class might be brought within and under the reach of educational influences, and immense expense and disaster saved to the City from the punishment and offences of such an ignorant population. They are aware that these recommendations, if adopted, will bring after them many new expenses to the Board and to the City; but they are convinced that nothing in the future will cost this City so much as IGNORANCE. The true economy

which should guide us in this matter is EDUCATION now, not PUNISHMENT afterwards."

That something additional was needed to cure the evil is abundantly evident from the strong language used by Mr. Randall, the City Superintendent, in his report presented to the Board at the commencement of the present year.

After denying that the Public School system is responsible for the crimes of those who refuse to take advantage of it, Mr. Randall continues:

"Equally confidently and unhesitatingly is the allegation denied that the Public School system either of the State or City is responsible as well for what it has failed to accomplish in the education of the entire population, to whom its doors were freely opened, as for what it has actually done. Neither the officers nor agents of these schools and systems have been invested with any authority to bring within their supervision those who did not voluntarily choose to place themselves under their guidance and control. Their doors were and have been invitingly open and free to every child in the community, rich or poor, high or low, virtuous or vicious. They have undertaken the responsibility of bestowing upon each child, fully availing himself of the facilities thus afforded, a sound, practical, Christian education, and to this high responsibility they should be rigidly held. But they have not undertaken, nor had they the power to undertake, the compulsory education of any child—nor can they, with any pretension to justice, be held responsible for the vices or the guilt of those who have never, or only for brief and intermitted periods of time, been placed under their instruction. There is, however, a fearful and solemn responsibility resting upon those who possess both the power and the means for securing the universal education of the future members of the community, and who have hitherto neglected and still continue to neglect to make such provision effectual. With the experience of ages before them, all pointing in the same direction, and all combining to demonstrate the intimate connection between ignorance and crime—with the moral certainty staring them in the face, that the idle and the dissolute, the darkened and the benighted intellects of to-day will become the paupers or the criminals, the robbers, the incendiaries, the burglars or the murderers of to-morrow. With the full knowledge that the streets and avenues of our great cities and towns are swarming with the rapidly ripening elements of wretchedness, and vice, and crime, and with the undoubted and clearly deducible power, even as a measure of self-defence and in the exercise of the most obvious means of salutary prevention, to arrest the further progress of this desolating plague, and to convert into a fertile source of blessing by a comprehensive and well devised system of universal education. The legislators of the Commonwealth yet shrink from the discharge of their imperative duty in this respect, and vainly and ineffectually hope to accomplish the work of reform by penal enactments and vindictive punishments? These are the men, and not the officers or agents of our public schools, who may legitimately be held responsible, not alone for the consequences and results of what they have done, but for what, having the power

and means to do, they have left undone in the intellectual and moral training of the youth of the State."

Even in monarchical England, where any supposed infringement of the liberty of the subject is regarded with so jealous an eye, and where changes in customs and laws are introduced with such wariness and scrutinized with such closeness, they are beginning to perceive that something more must be done to educate the masses than has hitherto been attempted. Indeed this very subject of compulsory attendance at school has lately formed a prominent topic of discussion both in the press and at public meetings; and distinguished men, such as the Dean of Carlisle and others, have come to the conclusion that a system which should make the sending of children to school until a certain age compulsory upon the parents, was the only remedy for existing evils. In the late debate on Education in the British Parliament, nearly all the speakers felt the difficulty in which they were placed by the statistics which had been produced, and were compelled to acknowledge that, although the "stubborn independence of Englishmen" would not readily brook compulsion, still something must be done. It was finally agreed that a Commission should be granted to inquire into the present state of education in England, and to consider what measures are required for the extension of sound instruction to all classes of the people.

In Scotland an intermediate method has been lately proposed. "It is a matter of experience and observation," writes the Editor of the *Scottish Guardian*, "that multiply schools till they are as common as public houses; and, without some means either of drawing or driving them, you will not carry down your education to the youth of the lowest stratum of society."

"How, then," the writer continues, "are the youth of the neglected poor to be brought under educational influences? Are the people of this country prepared to submit to the *driving* system of Prussia, where the policeman works to the hands of the schoolmaster. We think not. Exceptions there may and must be amongst the dangerous classes—such exceptions there are already in the compulsory education of the Reformatories; but we cannot imagine that as a general principle it is either desirable or possible to fill our common schools by direct compulsion. But there is an intermediate method to which we have frequently referred—that of rendering education a passport to employment. Let the employers of youthful labor be

prohibited from taking any young person into their workshops and factories without a schoolmaster's certificate of several years' attendance at school. This expedient seems the only way of cutting the Gordian knot. The experiment is surely worth trying. Is it too much to expect of the true friends of the education of the people, whatever be their opinions as to a national system, that they should agree in urgently recommending such a plan as this to the Government to begin with?"

This principle was recognized in the draft of an Education Bill introduced into the House of Lords by Lord Kinnaird and others; and very recently an Education Bill, introduced by the Attorney General of Australia, Mr. Michie, was carried by a majority of 38 to 11, by which the father of a child above seven years of age, of sound mind, unable to read or write, and not attending any school, is liable to be fined double the amount of the school-fees, ample provision being at the same time made for the gratuitous schooling of children whose parents are unable to provide instruction at their own expense.

Reformatories seem just now to be the panacea for all the ills of ignorance and vice in Britain. But surely in this case, as in others, "Prevention is better than cure." It is the most practical plan, the most efficient, the cheapest and the most beneficent. Reformatories are excellent as auxiliaries, but what can they effect alone in the large cities of Great Britain and of the United States where ignorance and crime amongst the masses are so general? Until recently it was acknowledged that in the case of England and Wales alone there were a million of children, of school age, receiving no school education of any kind. Such a condition of things accorded with the statement of the Prison Inspectors, who in their report for 1853 say that of 98,484 prisoners, 93,766 could neither read nor write, or could only do so very imperfectly—were, in fact, absolutely uneducated; while only 4,158 could read and write well, and 167 had received a superior education.

In a most instructive work lately published in London and written by Alexander Thomson, Esq., of Banchory, it is shown that with all their efforts to arrest the progress of juvenile crime, there is a fresh annual supply of 20,000 or 25,000 young criminals coming forward to keep up the number of the criminal population, which is estimated from the recorded convictions at a total for Great Britain of 104,988. "Let the reader," so writes the Editor of the *Glasgow Guardian*,

already quoted, "try to realise the idea of a vast army of criminals, amounting in round numbers to one hundred and five thousand, living in the midst of us, and reinforced by youthful recruits at the rate of five-and-twenty thousand a-year; and contrast this with the meagre and inadequate means employed to restrain and diminish such a formidable array of vice and social degradation.

"The cost of maintaining our army of thieves is startling. Twenty-five pounds a-year being taken as the lowest sum upon which a frugal and industrious couple, with one or two children, can subsist,—and double that sum, or fifty pounds a year, being assumed as the lowest amount of the income of a thief, who is the reverse of frugal,—it follows that the thieves of Great Britain levy black mail upon the public to the extent of £5,250,000 a-year; being equal to a tax of four shillings a-year on every man, woman, and child in the kingdom. But this estimate is probably far below the average, individual cases being noted in the prison reports, of thieves earning from £300 to £500 per annum for a succession of years.

"This estimate takes no account of the cost of maintaining criminals in gaol. But the money expense is the least of the evil. It has been stated on good authority that every thief corrupts at least ten boys, and thus multiplies his own malignant influence tenfold. So true is it that 'one sinner destroys much good.'"

And yet this same writer sneers at the *driving* system of Prussia, as he calls it, and "cannot imagine that as a general *principle* it is desirable to fill the Common Schools by direct compulsion," although at the same time he acknowledges that the absence of all intellectual and moral training is to be regarded as the principal source of juvenile delinquency! The popular tendency towards remedial rather than preventive measures is illustrated by the following characteristic anecdote, related by Mr. John Roberton, in an excellent paper read before the Manchester Statistical Society, last year, on certain legalized forms of temptation to crime:—"This reminds me," says Mr. Roberton, "of what used to be told of a town in Lincolnshire, notorious for ague. The better class of people, who lived in the higher town, and enjoyed good health themselves, were ever ready to supply Peruvian bark and ague-drops to sufferers from the fever, but they never thought of draining the neighboring marsh. Now, an engineer happened to visit the place, and, hearing of the ague, pointed out to

the inhabitants how easy it would be to get rid of the miasmata by means of a drain. The project was well received; but the owners of the property would not agree; there were difficulties in the way; the drain would be an innovation; it would be expensive; and so the marsh was allowed to exhale its poison as before. But, as some amends to those suffering from ague, the people of the high town redoubled their benevolence in the shape of bark and ague-drops. They refused to drain the marsh, but they were willing to cure the marsh fever."

As it was in Lincolnshire, so is it, I fear in Canada, and in this City of Toronto. Although we are too young yet to equal the Mother Country in our criminal statistics, still we make a very respectable attempt to do so. From the statistics of the Toronto gaol alone during the year 1856, as compiled by the Governor from the Gaol Register, the whole number of prisoners committed to the Gaol of the United Counties of York and Peel (including the city) was 1967. Of these, 401 males and 246 females could neither read nor write; 253 males and 200 females could read only; 570 males and 198 females could only read and write imperfectly; 68 males could read and write well; and only one male had a superior education.

In 1857 the following is the result of a similar Gaol census:

The total number of prisoners committed during 1857 was 1906; of these 298 males and 208 females could neither read nor write; 278 males and 264 females could only read; 727 males and 128 females could read and write imperfectly; 18 males could read and write well, and there were none who had received a superior education. From these statistics it appears that more than ninety-five per cent. of the 1967 prisoners committed to the Toronto Gaol during the year 1856, had grown up without the advantages of a good common school education; and 99 per cent. of those committed during 1857; facts which show that had a legal provision been made, such as would have secured to *all* these prisoners a good common school education, the number of prisoners committed to the Toronto Gaol during the last two years would not have exceeded one hundred, instead of swelling to 1967 and 1906 respectively; their crimes would have been prevented, and the time, trouble, and expenses attending their detection and punishment would have been saved. By returns obtained from Mr. Allen, it appears that the number of juvenile delinquents under fifteen years of age, who have been committed to

jail during the past five years, is 226, viz.: 191 boys and 35 girls. Mr. Gurnett, the Police Magistrate, writes me to say, that this number comprises scarcely two thirds of the whole who were brought to the Police Court on charges which could have been sustained against them, the residue being discharged—many because of the unwillingness of complainants to prosecute them on account of their youth, and many others being discharged, with admonition by the Court, rather than subject them to the contaminating influence of associating with hardened criminals in the jail, from whom, in the present condition of that establishment, they could not be separated. Mr. Gurnett adds that the total number of such juvenile offenders may have been about 340 or 350. Most of them were the offspring of the lowest and most vicious part of our city population, from whom both by example and precept, they have learned nothing but vice and crime. The greater proportion of them could neither read nor write, and of those who were examined on the subject, few, even of the oldest of them had any knowledge of the obligation or even meaning of an oath. Most of them were charged with petty thefts or pilfering, and in too many cases it was evident that they had been stimulated to commit the offences by their parents or other persons with whom they resided. Why then do we continue to imitate the people spoken of by Mr. Roberton, and provide at a very heavy expenditure "bark and ague drops," when we ought to be "draining the marsh?" This is a subject which has been brought before the public several times during the last few years, and it is one which is destined to occupy a still larger share of public attention in the future. Until it it is provided by law that every child of school age shall attend some school a certain portion of his time, the full benefits of the Free School system will not be reaped by the public. The Chief Superintendent of schools has long felt this, and submitted to government some three years ago a draft of a bill investing municipalities with power to see that "each child should receive somewhere a certain period of instruction," and in the *Journal of Education* for January, 1857, Dr. Ryerson writes:

Schools are, of course, not responsible for the crimes and conduct of those who never attend them; nor are school laws responsible for defects in criminal laws or police or municipal regulations. The Municipality that nobly provides for the education of all its youth, should undoubtedly have the power of preventing its youth from growing up uneducated.

We trust the current year will witness the taking of this last step towards securing to all the youth of the land, the full benefit of their Divine and human birthright—an education such as will fit each of them for his duties as a christian citizen."

Again the Judges on the Bench have made this the subject of special addresses. In the same month Mr. Justice Hagarty used the following language:

"The only class of people that property is practically interested in educating, is not compelled to accept, and exercises its right of rejecting the boon. But it seems a very plain proposition that, co-extensive with the legal obligation *to teach* should be the legal obligation *to be taught*. If it be said that it would be an interference with the rational liberty to enforce attendance at school, the answer seems very reasonable. It would be an interference, but to no greater extent than the compulsory contributions by assessment for school rates. In a well regulated city, all nuisances are removeable by law. Every citizen has to surrender a certain portion of his freedom of action for the general good. So long as compulsory assessment for school purposes prevails, it could not be unreasonable to compel every head of a family to satisfy the school inspectors that his children were regular in attendance on some course of instruction, private or public, as he should think proper—allowing all freedom of choice in selecting the peculiar mode or place, but insisting on satisfactory evidence that education was not neglected."

This we conceive is correct reasoning. "The community has the right, and it is its duty to require that the liberal and munificent outlay which it invests in the education of its citizens shall not be virtually counteracted or rendered unavailing to the accomplishment of the purposes for which it is designed, by the culpable and criminal neglect of a large portion of its members to avail themselves of the facilities thus placed at their disposal. It has a right and it is its duty to insist that for every dollar contributed towards the education of the people, at least an equal amount shall be deducted from the annual assessment for the maintenance and punishment of criminals, and the support of vagabonds and paupers; and this result it can secure only by gathering into the institutions of learning provided for that purpose, *all* those of a suitable age for whose mental and moral culture no other adequate provision has been made." Let us then begin in time to save our country from the danger as well as the disgrace which must result from allowing the children, especially of our large towns to remain uneducated, and thus descend to the depths of social and moral degradation. To wait until the evil is done and then try to remedy it by reformatories and ragged schools

and similar medicaments is but trying to cure the marsh fever by "bark and ague drops" without curing the marsh itself by a process of thorough and universal draining.

REVIEWS.

Historical and Statistical information respecting the History and prospects of the Indian Tribes of the United States; Collected and prepared under the direction of the Bureau of Indian Affairs. Vols I. and II. Philadelphia, 1851.

The subject of the languages of the aboriginal tribes of the North American continent is one, the importance of which to the comparative philologist, the ethnologist and the philanthropist, can scarcely be overrated. To the first it opens up a wide field of inquiry, the borders of which have only just begun to be cultivated; to the second it furnishes a clue which cannot but assist him in his interesting researches, and by the last in the person of the Christian Missionary it cannot be neglected without his being justly taxable with unfaithfulness to the all-important work that the great head of the church has assigned to him. Every well-wisher, therefore, to the cause of science or that of Christian civilization must hail with pleasure every work that tends to throw light on a subject of such great interest, but which so few are at all competent to handle; and for this reason we were disposed to regard favourably the work, the title of which we have placed at the head of this article, though we could not but regret that the information it proposed to give on the subject of the habits and languages of the Indian tribes was buried under the load of six enormous volumes which even those that are rich enough to place on their shelves, cannot always spare the time requisite for such laborious literary excavation.

To ensure the success of a person who would enrich science with lore drawn from the hitherto unwrought mine of the North American languages, it is absolutely necessary that he possess two qualifications: first a competent knowledge of the class of languages into the philology of which he professes to enter; and, secondly, a sufficient acquain-

tance with the grammar and literature of civilized and learned languages to enable him to mark the analogies and differences that exist between them and the less known tongues whose genius and character he would desire to make the property alike of the comparative philologist and the missionary.

In this respect the languages of the western continent have hitherto been unfortunate; while men of the highest mental calibre, a Henry Martyn, a Sir William Jones, a Claudius Buchanan, a Lee and a Morisson, have applied their fine intellects and varied attainments to the elucidation of the languages of the east which they had previously thoroughly mastered, no one has yet arisen who can be said to occupy the place with reference to the languages of the western, that those eminent and highly gifted men did towards those of the eastern continent. It is true that many eminent men both in America and in Europe have directed their attention to the North American languages, but they have been groping in the dark, they have been like skillful miners who had gone down into a rich but new mine without the accustomed light to direct them; they pass along extensive galleries on every side of which the richest jewels protrude, but they discern them not. They painfully take with them to the surface what they suppose to contain the riches that they were in quest of, but which when exposed to the light of day are found to contain nothing valuable. There are others again who during a long intercourse with the aboriginal tribes have made themselves thoroughly acquainted with their language, but, through deficiency of general education and entire unacquaintance with philological science are unable to make their knowledge available for the guidance and information of others. But we have yet to find the man who combines those two qualifications and when we do, we may expect much more light to be thrown on the genius and peculiarities of the western languages than has yet been done.

Our republican brethren will at once reply that the vacant post has already been filled by their countryman Mr. H. R. Schoolcraft. This position has been claimed for him by the American press; we have seen it more than once asserted in popular periodicals published in the United States, that Mr. Schoolcraft understands the languages of the American continent better than any other living white man. It has been claimed by that gentleman himself, for he says at page 354 of volume 2, speaking of himself, "He may plead on his behalf the

force of circumstances, which during a period of upwards of thirty years have placed him in the extreme solitude of the forest in contact with the aborigines, under auspices extremely favorable to the acquisition of their language, and to the collection and examination of facts and materials, * * * and the situation he has filled has opened sources of information of which the assertion may be ventured, it is believed, without presumption, that he has wanted neither opportunities, disposition, nor assiduity to avail himself of;" again, at page 355 he says "I have deemed this much necessary to satisfy public curiosity and to justify grammatical positions, which if they are sometimes stated with much confidence, are the result of full convictions, mature inquiry, and ample opportunities."

How far the claims thus set up to be henceforth regarded as an authority in all that concerns the North American languages is sustained by the character of what he has brought forward as the result of his inquiries into this interesting subject, it is now our business to examine.

We freely confess that the first of those ponderous and expensive volumes did not lead us to expect much from the compiler in the way of elucidation of the grammatical or etymological structure of the Indian Languages. We believed that the glaring errors into which he has there fallen in giving what he supposed to be the meanings of the several Indian Songs that he had laid before his readers, arose from the unfaithfulness or incompetence of the interpreter whom he had employed for the purpose; but we never could have imagined that the compiler laid claim to any thing like an intimate acquaintance with the languages, of the meaning as well as the pronunciation of whose vocables he has there shown such ignorance.

It would lead us too far away from the main object of this paper to give many examples of this misrepresentation of the meaning of Indian songs which struck us so forcibly in looking over the first volume, but we cannot resist the temptation to take one or two of them at random. Page 384, Vol. I. "No 4 depicts the symbolical union of a meda with a bird. He affects to have all space at his command and to be gifted with powers of supernatural locomotion.

<table>
<tr><td>Ah-wa-nan
Ba-bah-mis-saud
Ween-jeeh
Uh-nish-an-aw-ba"</td><td>Should have been written, to make any sense at all,</td><td>Ah-wa-nan
Wan-je
Ba-bah-mis-sad
Un-ish-ah-nah-ba</td></tr>
</table>

This song Mr. Schoolcraft renders, "Who makes the anishenabba my fellow walk about." Now there is no word in it having the meaning "my fellow," and none to signify "walk" nor translated in that way does it in the slightest degree elucidate the symbol (a winged human figure) to which he refers. The proper translation of the words is "Who is he on account of whom a human being flies?"

Again at page 401, Vol. I. we have the following:

"4. To the great spirit
In ah wah owh mon e do
In ah wah owh mon e do
I au ah jim ind
Gee zhik oong a bid"

which Mr. Schoolcraft renders thus: "Look thou at the spirit; it is he that is spoken of who stays our lives who abides in the sky," but of which the correct translation is "Lo this God; Lo this God is he of whom it is told that he is in the sky," there being no word that in the slightest degree approaches to the meaning of "who stays our lives," the second line which Mr. Schooolcraft so translates being, as even the merely English speaking reader can satisfy himself, a repetition of the first.

These examples, which are only slight specimens of what we could adduce from almost every page of the first volume in which Indian phraseology and its interpretation are professedly given, will serve to show that we were fully warranted in coming to the perusal of Mr. Schoolcraft's second volume with no very sanguine expectations as to the result of his researches into the genius of a class of languages with which it was already plain to us he had so little personal acquaintance.

On the treatise in the second volume we would in the first place remark that we find in it the same misrepresentation of the meaning of words as marks the author's attempts at interpretation in the first volume. Thus we have *a-dit-tag* plural *a-dit-ta-gin* interpreted as fruit, fruits, when they really signify "that thing which is ripe—those things which are ripe;" thus giving a false idea of the genius of the language which contains no generic word for fruit, but only specific words for the different kinds of fruit *ex. gr.* an apple, a plum, just as it contains no word for "time," but only for the natural divisions of it, a day, a month, a year. Again at page 369 *iah-pa-de-nah* is translated a "hill," though it is a verb in the indicative present, 3rd pers. sing., signifying

"it is elevated ground," and consequent on this blunder the still greater one of giving as its plural a word that does not exist in the language: there is no word to express "hill" as distinguished from "mountain," the diminutive form of this latter word being used for that purpose.

Mr. Schoolcraft is decidedly wrong in saying that the numeral "*pazh-ik* (one) represents the English indefinite article; it is never so used, but, with very few exceptions, wherever it occurs, it is in its proper numeral sense. In the phrase that he adduces as an example "*pa-zhik muk-wun ooge-wah-buh-maun*," it means that he saw *one* bear, not two or many. The Indian for "he saw a bear" without the idea of number would be simply "*oo-ge-wah-buh-maun muk-wun*:" indeed Mr. Schoolcraft himself unwittingly furnishes us with an example which disproves his own rule, for a little after (page 372), he give us, for "he or she loves a man" a sentence precisely similar to "he killed a bear" "*so-ank ge-aun en-ne-ne-wun*" showing that in his former sentence *pa-zhik* is not an indefinite article but a numeral adjective. The nearest approach that *pa-zhik* ever makes to the signification of an indefinite article is to be found in the very few instances in which it occurs in the sense of the Greek enclitic τις—a certain one.

We look upon Mr. Schoolcraft's observations on the possessive of substantives as very unphilosophical and very incorrect, inasmuch as they ignore a very interesting and important feature of the language, namely, that it makes modification of the sense of words by a double agglutination of particles—a prefix and an affix—both of which are absolutely necessary to the additional idea and one of which without the other would add nothing to the meaning of the original word, thus "*pe-zhe-ke*" is a bison, "*ne-pe-zhe-keem*" my bison, but *ne-pe-zhe-kee* would have no meaning, neither would *pe-zhe-keem*, both the prefix and affix being abolutely necessary in order that the word should come before us in its possessive form. But one unacquainted with the language would gather from Mr. Schoolcraft's observations that it is the affix alone that imparts the possessive meaning; he might as well attempt to divide the *h* from the *s* in the English possesive his" as to think of giving to an Ojibwa noun a possessive meaning without the prefix as well as the affix.

His remark on the third person singular possessive form is equally open to objection, "mun" being in that case just as much part of the possessive as is the terminal *m* of the first and second persons, and

not as he represents it to be, the sign of the objective, which is evident from the fact that the form is the same where "his bison" is the subject instead of the object of the verb. Another case in which the same principle of double agglutination is exemplified is the mode of expressing a negative by the prefix "*kah-ween*" and the affix "*se*," thus *wah-be* he sees, *kah-ween wah-be* would not impart a negative form to the verb; it would mean "no, he sees" but *kah-ween wah-be-se* "he does not see," being somewhat analogous to the French *ne pas*.

Again at page 373, Mr. Schoolcraft, through his ignorance of the Algonquin idiom has lost an opportunity of bringing to the notice of his readers a very interesting peculiarity of the language. "His father's dog" he renders in Indian *oo-sun oo-dy-un*, which would not be his father's dog, but "his father, his dog," the way to express his father's dog being, *oo-sun oo-dy-e-ne*. This brings out a striking peculiarity of which Mr. Schoolcraft must have been altogether ignorant when he made such an Indian sentence as that which we have just quoted from his treatise; it is this, when a noun in the objective case, or with the third person singular possessive particles, has another noun in the possessive case attached to it, the noun so attached changes its possessive affix into "*e-ne*" thus in the sentence quoted we have *oo-sun* of the possessive form, but to it belongs another noun in the possessive form "his dog" which must be rendered *oo-dy-e-ne*. The use of this second possessive form will be made plain by the following example: "He slew his brother and his wife" leaves it uncertain whether it was his own or his brother's wife that he slew; not so in the Algonquin languages,—*oo-ge-ne-saun we-kah-ne-sun kuh-ya we-wun* would mean "he slew his brother and his own wife," *oo-ge-ne-saun we-kah-ne-sun kuh-ya we-we-ne* would mean "he slew his brother and his (*i.e.* his brother's) wife. Jesus loved Martha and her brother:—*Jesus oo-ge-sah-ge-aun Martha-un kuh-ya oo-dah-wa-mah-ne* not *oo-dah-wa-maun* which would signify Jesus own sister (used of the relation of a male, *oo-dah-wa-maun* signifies his sister, of that of a female, her brother). We think that an error that involves the ignoring of so interesting a peculiarity is unpardonable in a person making such pretensions as we have seen Mr. Schoolcraft does.

While we are on the subject of this second possessive it is as well to remark that it affects the verb also. That is to say, when a noun having the third person singular possessive particles is the subject,

the verb changes its form to correspond with it, *ex. gr.* while the sentence "a man saw a bear" would be rendered *Enene oo-ge-wah-buh-maun muk-wun* the sentence "His father saw a bear" would be in Indian "*oo-sun oo-ge-wah-buh-mah-ne muk-wun*" not *oo-ge-wah-buh-maun*. None but those who have occasion to address Indians on subjects that require great precision of expression can form any idea of the advantages that this peculiarity gives, or what confusion is produced by ignorance or neglect of it.

Mr. Schoolcraft's grammatical analysis is as much at fault as his translations from Indian to English, and *vice versâ*, of which we will give a few examples out of very many that might be adduced did space permit.

At page 384 of his second volume, he says of certain nouns "By prefixing '*Tah*' to these words, and changing the inflexion of the animate nouns to *e-we*, and that of the inanimate to *e-wun*, they are rendered future thus, *Tah-Pontiacewe Tah-mittigewun*." The principle after which he seems in this passage to be groping, but which he has evidently failed to discover is this, all nouns are capable of being transformed into verbs by the addition of "*we*" for animate forms, "*wun*" for inanimate with an euphonic or agglutinating vowel, varying in different words when the noun to be thus verbalized ends in a consonant thus, *en-e-ne* a man *e-ne-ne-we* he is a man, *oo-da-nah* a town *oo da-nah-wun* it is a town, or there is a town *mah-een-gun* a wolf, *mah-een-gun-e-we* he is a wolf, *me-tig* a tree, animate) *me-tig-oo-we* it is a tree; and being thus verbalized the word becomes capable of all the inflexions of a verb of which the future indicative 3rd person singular made by the prefix *Tah*, is of course one. These verbalizing affixes are in reality fragments of the verb *ah-we* animate, and *ah-wun* inanimate "he is" "it is" in an identifying sense; thus it makes but little difference to the sense whether we say "*en-e-ne ah-we*" it is a man *oo-da-nah ah-wun*, it or there is a city, or *en-e-ne-we oo-da-nah-wun* but in the use of the former the inflecting particles continue with the original verb, in the latter case they belong to the verbalized noun, thus we say *tah-e-ne-ne-we* but *en-e-ne tah-ah-we* he will be a man, *tah-oo-da-nah-wun* but *ooda-nah tah-ah-wun*, it or there will be a city.

Mr. Schoolcraft is as much astray in his rules for converting verbs into nouns as we have already shown him to be with regard to those for turning nouns into verbs. At page 390 he says, "their names for the various utensils of civilized life are based on the word "*jee-gun*" one

of those primitives which, although never disjunctively used, denotes in its modified forms the various senses implied by our words instrument, contrivance, machine:" of which we may safely say that such a primitive word exists nowhere nor never did, except in the writer's imagination, the forms that he gives being derived from verbs in *je-ga*, *keesh-ke-booje-ga* he divides crosswise *taush-ke-boo-je-ga* he cuts down the middle or lengthwise from which by changing the verbal termination "*ga*" into the nominal "*gun*" the class of words that he gives are all formed, *keesh-ke-boo-je-gun* a cross-cut saw, *taush-ke-boo-je-gun* a saw to cut lengthwise, hence a saw-mill. The correctness of this analysis will be at once seen by examining such words as *wee-de-ga-mah-gun* (Mr. Schoolcraft says that the termination "*gun*" is always a contraction for *je-gun*) a companion, a wife *ke-ke-noo-ah-mah-gun* a person under instruction, a disciple; where the termination, "*gun*" could not possibly be a contraction for *jee-gun*, instrument, machine, even did such a primitive exist in the language.

Two more instances of the errors into which Mr. Schoolcraft's want of knowledge of the language of whose interpretation and genius he claims to be considered the exponent, leads him we will select from his chapter on substantives, and then pass to that on adjectives. At page 372 he gives the following Indian sentence "*Waub-oo-jeeg oo-ge-me-gah-naun naud-ah-wa-se-wun*" which he translates "Wauboojeeg fought his enemies." Even had the word *naud-ah-wa-see* signified "enemy" *naud-ah-wa-se-wun* would not express "his enemies," as it wants the possessive prefix which is never dispensed with in Indian as the possessive pronoun is frequently in Greek and Latin, but *naud-ah-wa-see* does not signify "enemy" but "Sioux Indian," and therefore the sentence quoted is good Ojibwa, meaning however, "Wauboojeeg fought the Sioux." The error is just as if a school-boy should translate "Cæsar vicit Gallos" by "Cæsar conquered his enemies." Again at page 376 he represents the word *and-ah-yaun* which he pretty correctly interprets by the English word "my home" (it should rather have been "at my home") as a substantive; whereas it is the subjunctive and participial form of the verb "dah" he dwells, and signifies "where I dwell," and this at once accounts for the want of the possessive pronominal prefix, as there is no idea of possession about the word and the word *an-dah-yaun-in* that he gives as the plural really signifies "whenever I dwell," "wherever I dwell."

From Mr. Schoolcraft's chapter on adjectives, we would be led to

conclude that the Algonquin languages are very rich in that part of speech which, were it the case, would furnish a reply to his own hypothesis of the affinity of these languages with those of the Semitic group which are known to be particularly defective in adjectives. But the very contrary is the fact; few languages we believe exist, in which there is a greater deficiency of purely adjective forms; those of which Mr. Schoolcraft gives so copious a list being all verbs, *mah-nah-dud, mah-nah-de-ze*, signifying not "bad," but "it is bad," "he is bad." *muh-kuh-da-wah, muh-kuh-da-we-ze*, not "black," but it is black, he is black, which words are capable of being put through all moods and tenses, just as other verbs; and when we need to express the simple adjective, we cannot get nearer to it than by using what for want of a more appropriate designation may be called a participle, *mah-yah-nah-duk*, "which is bad;" *mah-yah-nah-de-zid*, who is bad; *ma-kuh-da-waug*, which is black; *ma-kuh-de-we-zid*, who is black; *on-e-she-shin*, not "good," but "it is good," the participle of which, *wa-ne-she-shing*, stands in Indian translations for our word good as applied to inanimate nouns. This error vitiates the whole of Mr. Schoolcraft's chapter on adjectives; but, besides this, he has fallen into many errors in his details; he has restricted the adjectives *muj-je*, bad; *me-noo*, good, which are two of the very few true adjectives of the language, to animate nouns, than which restriction nothing can be more unfounded: these and all other adjectives being applicable without change of form to both animate and inanimate nouns. Even were we not able to draw on our own knowledge for instances innumerable to the contrary of Mr. Schoolcraft's restriction, we find sufficient for our purpose in what he has himself written, for he gives us the expressions *muj-je-be-mah-de-ze-win* and *me-noo-be-mah-de-ze-win* for bad conduct, good conduct; also, a little further on, *muj-je-kezh-e-gud me-no-ke-zhe-gud*, a bad day, a good day. The truth is that the few adjectives that belong to the language are, without exception, undeclinable, *i. e.*, not possessing distinct animate and inanimate, singular and plural forms. A mode of supplying the deficiency of adjectives that is largely practiced by the Indians seems to have escaped the notice of Mr. Schoolcraft, and, what is still stranger, of Bishop Baraga in his grammar, —which, though extremely deficient in clearness and arrangement, is generally very full and correct,—and that omission is the more to be regretted, as it affords the comparative philologist one of those few links that serve to bind the languages of the new to those of the old world: we

mean the mode in which the numerous class of adjectives represented by such words as wooden, golden, earthen, are formed, namely, by the agglutination of the substantives wood, gold, earth, &c., to the noun whose quality is to be designated. Thus, *me-tig-oo-che-maun*, a wooden canoe; *me-tig*, being wood and *che-maun*, canoe; *oo-sah-wah-shee-ne-yah we-wuh-quaun*, a golden crown; *wah-be-gun-e oo-nah-gun*, an earthen vessel, which is closely analogous to the Semitic expressions vessels of silver, and still more so to the English silver vessels, gold pens, &c.

Mr. Schoolcraft's attempts at etymological analysis are not unfrequently bordering on the ludicrous; we will instance one at page 397. Speaking of such words as *mis-quah-be-kud*, it is red rock or metal; *mis-quah-bik-e-ze*, he is red metal; he has the following observations; "The word 'is' (included in brackets) in the translations, is not deemed to be wholly gratuitous; there is, strictly speaking, an idea of existence given to these compounds by the particle 'au' in au-bik, which seems to be indirectly a derivative from that great and fundamental root of the language, *i-au*." In this passage Mr. Schoolcraft's inconsistency with himself is easily made plain, even to a reader totally unacquainted with the language. At page 389 he had correctly given *au-bik* as the generic radix signifying any solid, stony, or metallic mass; then, at the beginning of page 397, he had again correctly given *misk-wau-bik* as signifying simply red rock; but, if his analysis on which we are now commenting were correct, *misk-wau-bik* would signify it is red rock, as it contains the syllable *au* as well as *misk-waub-ik-kud*, in which case the affix "*ud*" would be useless and unmeaning; but in truth it is this affix "*ud*" for the inanimate, *iz-ze* for the animate, that is alone the verbalizing particle, and the connexion between the *au* of the radix *wau-bik* and the verb substantive *i-au* exists only in Mr. Schoolcraft's imagination. Before quitting the subject of adjectives, we would beg to take exception to Mr. Schoolcraft's remarks on such words as *pa-pa-zhek*, as found in the compound word *pa-pa-zheg-oo-gun-zhe*, a horse, on which he has the following remarks, page 389: "In naming the horse *pa-pa-zhe-koo-gah-zhi*, *i. e.*, the animal with solid hoofs, they have seized on the feature which most strikingly distinguished the horse from the cleft-footed animals. *Pai-zhik* is one, and is also used as the indefinite article. The word *pa-pa-zhik* is also used in an adjective sense, figuratively, indicating united, solid, undivided." Now, the word *pa-pa-zhig* does not mean

solid, undivided, but is the distributive form of the numeral *pa-zhik*; and so *pa-pa-zhe-goo-gun-zhe* signifies not "the animal with a solid hoof," but "the animal with one hoof to each foot," in contradistinction to cloven-footed animals, as the deer, the bison, which have two hoofs to each foot. Mr. Schoolcraft does not appear to have been aware that the Ojibwa is furnished with a set of distributives formed from the cardinals by prefixing a reduplication; for example, pa-zhik, one; pa-pa-zhik, one each; neezh, two; na-neezh, two apiece, &c., corresponding exactly with the Latin "singuli, bini," &c., in which respect it has the advantage of the Greek, where a circumlocution is used to express the distributive idea.

We will not dwell long on the chapter of pronouns; but, having made one or two observations, will hurry on to that on verbs; and the first error of Mr. Schoolcraft, under that head, that we would point out to his and our readers, is another case of false analysis, so many of which are to be found in the whole treatise. We refer to his remarks on the first word of the Lord's prayer, as it occurs in the translation of the Liturgy of the Church of England now used in the Episcopal missions to the Algonquin tribes both in British North America and in the United States. At page 406 he says: "The term *Wa-yoo-se-me-goo-yun*, signifying father of all, or universal father, seemed precisely the word wanted; but it was throwing the object in so general a relation that philosophy alone appeared satisfied with it." The word does not signify "Father of all," nor is there the slightest shade of the idea of universality in it, as will be seen from the following analysis: *oos* is the radix of the word signifying father; *oo-yoo-se*, he has a father, which becomes passive by the addition of *mah*, *oo-yoo-se-mah*, he is held in the relation of father, of which the participial form of the second person plural is *wa-yoo-se-me-goo-yun*, "thou whom we have for a father," or "thou who art held as a father:" for it is one of the deficiencies of the language that these two ideas are expressed by the same form, or to speak more exactly, that two different parts of the verb in the course of inflexion bring out the same combination of sounds. Thus "you are loved," and "we love you," are expressed by the same word, a deficiency which, however, is no reproach to the language, seeing that it has it in common with others, and those the vernaculars of highly polished and civilized races; thus we have in Attic Greek λυῃ, 3d sing. subj. pres. active; λυῃ, the indic. pres. 2d sing. passive, and λυῃ, the subj.

pres. 2d sing. passive, from which coincidence of sound, however, no inconvenience is ever felt, seeing that the context of the word at once determines in what sense it is used. Thus explained, it is evident that the word *Wa-yoo-se-me-goo-yun*, thou who art our father, is exactly the word required to express the "Our Father" of the Lord's prayer. *Noosa*, which Mr. Schoolcraft seems to prefer, being manifestly inappropriate to the form and subversive of the very spirit of that prayer, it never meaning any thing but "my father," not "our father."

In a treatise containing so much that is erroneous both in principle and detail, it is difficult to select subjects for comment, seeing that in a paper confined within such narrow limits as the present, so much must be left untouched; but we will select another instance from the chapter on pronouns as illustrative of the very unphilosophical principles of etymology adopted by Mr. Schoolcraft; at page 406 he derives the verb *ah-we*, first person singular *auw* (is, am, in an identifying sense) from "yow," the radix of *we-yow*, "his body," and then translates "*nin-dauw*," I am a man; *ah-we*, "he is a man;" whereas nothing can be more erroneous than such etymology nor anything more incorrect than the interpretation that he grounds on it. To derive *auw*, am; *ah-we*, is, from "*yow*," body, is just as if the Greek and Latin verbs *ειμι* and *sum* were asserted to be derived from the Greek *σωμα*, a body, a derivation too far-fetched for even the most fanciful of the old lexicographers. We would adduce many other instances in which mere similarity of sound is the only basis on which Mr. Schoolcraft builds abstruse, and, to the uninitiated, learned-looking etymological dissertations. On the assumption of the supposed connexion between *yow*, body, and *nin-dauw*, I am, he interprets *nin-dauw*, I am a man; *ah-we*, he is a man, which is a total misrepresentation, the signification of these words being simply "I am," "He is" (not in the sense of existence, which would be *nin-dah-yah*, *ah-yah*, but of identification); for a proof of which, appreciable by those who do not understand the language, we have not to go beyond Mr. Schoolcraft's own book, at page 469 of the second volume of which, at the end of the Algonquin vocabularies, we find a translation of the mysterious and awful formula in which the Divine Being defines his own existence, "I am that I am," all of which vocabularies give *nin-dauw* as the word for "I am," which would be singularly inappro-

priate if *nin-dauw* signified "I am a man," or even if it ever so remotely contained the idea of body.

In the beginning of the chapter on verbs, we have an elaborate dissertation in which the untenable theory of the originally monosyllabic character of the Algonquin languages is maintained, the author says, page 424, "It is evident that such particles as *ak*, *be*, *ge* were invested with generic meanings before they assumed the concrete forms of *a-ke*, earth; *ne-be*, water; *ge-zis*, sky." We would ask, Evident from what? and what were the ancient generic meanings of those particles? how does the author know that such was the case? and, supposing his monosyllabic theory admitted, how does he know that *ke*, *ne*, *zis* were not the particles invested with generic meanings? for on none of those very natural points of inquiry has he given his readers any information. We have at page 426 an instance of the absurdities into which an unfounded theory will lead a person practically unacquainted with the subject on which he is philosophizing. One would have supposed that the word "*Boz*," embark, was sufficiently short to have been admitted by Mr. Schoolcraft to the dignity of a primitive radix, but not even so thin a hair as this can escape him, he must split it up till not the most microscopic philology can discover its component parts, its "disjecta membra," in the wide field of the Algonquin vocabulary. On this word he has the following very characteristic passage: "This is the simplest form in which the word occurs colloquially, but it will at once be perceived to be a compound. *Ozh* seems to be the root of every species of contrivance designed to float on the water, which has been made with hands; the latter idea is incorporated in the word and appears to be derived from *oo-zhe-ah* to make up (v ep) *oo-zhe-toon* (v anti ep). *Ozh* appears to be the root for the name of a vessel." Now, in the first place, we would ask on what principle it is evident that this word is a compound? certainly not from Mr. Schoolcraft's own theory of monoysllabic roots for *boz* is nearly as short a monosyllable as could be." How does *ozh* appear to be the root of every species of contrivance designed to float on water? certainly not from the vocabularies that he has given at the end of his treatise, (which though by no means correct, yet bear marks of having been contributed by persons knowing much more of the language than he does,) for there we find two words, and only two, denoting contrivances designed to float on water, namely: *nab-be-quaun* —a ship, *na-bug-e-chem-aun*—a boat, into neither of which does the

syllable *oosh* enter; again we would ask if the sound *ōs* in *bōz* belongs to the imaginary root *ozh*, floating thing, how in the name of common sense can it have anything to do with *oo-zhe-ah*, he is made (not to make as Mr. Schoolcraft has it)? But, suppose we allow *oz* to pass muster, where is the other part of the compound? the author does not enlighten us as to whence comes the etymological molecule *b*. But the fact is, that the component parts of the word *bōz* have no existence except in Mr. Schoolcraft's very fertile imagination, the word being a root word of the very simplest kind, signifying to enter into any machine, *nautical* or *otherwise*, that is about being put in motion as a canoe, a sleigh, a carriage.

Having already prolonged these remarks to a greater extent than we had intended we will leave Mr. Schoolcraft for the present, having first corrected him in reference to a point involving one of the principles of the Indian verb: we mean his assertion that the subjunctive mood is formed by prefixing the word *kish-pin* to the several forms but not in any wise altering them: (page 431 and again page 433.) "The other tenses of the indicative mood all admit of the same prefixed term *kish-pin*, if." The very contrary of these statements is the case; the subjunctive is never formed by the mere prefixing of *kish-pin*, but requires a very extensive change indeed in the modifying suffixes, and *kish-pin* prefixed to the indicative forms of the verb is utterly inadmissable. For confirmation of what we say on this point we appeal to the paradigms which Mr. Schoolcraft has given in the body of his treatise (evidently furnished by another hand, though much spoiled in passing through the press); 1st. the paradigm of *atta* "to be" impersonal, page 441, we have indicative, *at-ta*, it is, subjunctive *kish-pin at-tag*; here we see that the *kish-pin* is not prefixed to the unchanged indicative; again the verb *I-eau*, to be, personal indicative, 436–438; *nin-dah yah*, I am, subjunctive *i-au-yaun*, if I be. The rule is that in the indicative the pronoun is expressed by a prefix as *ne-waub* I see, in the subjunctive by a suffix as *wah-be-yaun*: the conjunction *kish-pin* never being incorporated in the word but always placed with regard to it in the same position, as "if" in English the *ἐαν* of Greek and the *si* of Latin, such a form as *kish-pin ne-saug-e-aug*, *kish-pin ov-sah-ge-aud* (page 433) would be sure to produce a smile on the faces of an Indian audience at the expense of him who should use them.

In a note at the end of his chapter on verbs, Mr. Schoolcraft very

justly animadverts on the reason given by Mr. Baraga in his grammar for the dubitative form of the Indian verb, by which, what an Indian thoroughly believes to be true is sometimes expressed in a form (*doog* for the indicative, *an wan* for the subjunctive) expressive of some degree of uncertainty. This Mr. Baraga traces to the Indians' habitual want of truth in their intercourse with one another. We think it quite capable of the very opposite interpretation, namely, that an Indian is so much afraid of stating what he does not know to be the case, that he has invented a form of speech which enables him to keep considerably within the line that divides truth from falsehood.

It seems to have escaped the notice of both Mr. Schoolcraft and Mr. Baraga that a similar usage holds in Attic Greek where the dubitative particle *αν* with the optative mood is used where no doubt is intended to be implied (*όυκ άν φευγοις*, you will not escape), and we are not aware that even the Roman satirists ever ascribed this usage to the proverbial untruthfulness of the Greeks. In fact the Algonquin dubitative form is merely the formula credendi, or mode of expressing belief as distinguished from personal knowledge.

In conclusion, we have to express our regret that a work coming out under such auspices as that, the two first volumes of which have drawn forth the above remarks, should be so incorrect both in principle and detail, especially as we are aware that from the circumstance of its having received the imprimatur of the United States Government, it is looked on as an authority in all that refers to Indian literature and language. Longfellow, for example, has much injured the effect of his otherwise beautiful poem Hiawatha by the many errors into which he has fallen in the Indian words that he has worked into it, chiefly, it would appear, from having taken Mr. Schoolcraft as his guide.

F. A. O'M.

The Sandwich Islands Monthly Magazine. January to May, 1856. A. Fornander, Honolulu.

The New Era, and Argus. Honolulu, 1857.

The Victoria Gazette. Vancouver's Island, 1858.

The progressive diffusion of the language, the social habits, and the elements of freedom of the Anglo-Saxon race, justly awakens fresh wonder and admiration with every new manifestation; and the peri-

odicals we have named at the head of this article are highly characteristic indices of recent advances. "The love of religious conquest," says a recent American writer, in treating of *The prospects of the English language*—"The love alike of literary, commercial, and military conquest, which the Anglo-Saxon race have shown, and are now showing, all over the globe, will each diffuse the language. The British empire, extending over one hundred and fifty-six millions, listens to that language as to a voice of power. The population of the United States, doubling every twenty-five years, already amounts to more than twenty millions. The French population of Canada, the Spanish population of Mexico, will give place to the Anglo-Saxon race, or rather, as in past time, be absorbed in it. We may believe that, fixed in the standards of the national literature [of the United States,] the language of the Constitution will be familiar to the hundreds of millions in North America as their vernacular tongue; and that Shakspeare and Milton will be read ages hence on the banks of the Connecticut and the Potomac, on the shores of the Columbia and the Francisco." That such anticipations of the future destiny of the English language are not extravagant, seems to find corroboration even in such ephemeral yet significant literature as that now under review.

The printing-press, that great engine of modern social reformation and revolution, no longer waits for the consolidation of settled communities and the luxurious leisure of accumulated wealth, to invite its presence. It marches with the van-guard of the Anglo-Saxon nomades, and materially contributes to the rapidity with which they hew a home out of the wild forest, and change the wilderness into a centre of civilization.

The Victoria *Gazette*, the most recent of the above named periodicals, is the first paper published on Vancouver's Island, the fruit of that sudden migration which the recent gold discoveries have attracted to the North-western regions around Fraser's River. This paper is issued twice a-week; and from its second number, dated June 30th of the present year, we extract the following amusing editorial sketch of the "Printing House Square" of this, the newest world of civilization:—

"The present number of the Victoria *Gazette* is prepared for publication in a room more remarkable for its extent than convenience. Its walls abound in crevices, through which the wind bears with an impartial equality the seeds of catarrh and bronchial afflictions to the editors, proprietors, and typographers. Its

floor is of a shaky character, and each passer imparts a tremulousness to its surface which occasions the present writing to assume a character that Champollion, were he one of our compositors, would find it difficult to decipher. Cavities, large and small, lie in wait for individuals passing into and about the establishment, which have already resulted in serious shin damage to the major part of its occupants. The 'editor's desk' is a bundle of printing paper, skilfully poised upon a leather trunk, vibrating with each movement of the writer's hand, and compelling him to double up his person in the act of preparing 'copy' in a manner more curious than graceful. The 'Editor's Easy Chair' is a Chinese trunk, whose top would be on a level with the desk, but for the brilliant idea of increasing the height of the latter by the paper expedient alluded to. The striking thoughts which pervade the brain of the individual favored with these facilities would find a much readier expression at the point of his pen, but for the drawback of being compelled to retail copies of this journal, receive items of news, and correct misdirected intruders on the point of their destination, simultaneously with inditing these remarkable conceptions. Two huge fire-places adorn our sanctum. These ornaments, having been built with a view to convey all the heat as well as the smoke up the chimney, are as little dangerous in the matter of risk of a conflagration as they are but slightly conducive to comfort in modifying the blasts of Boreas which dispute occupancy with the present sojourners in the establishment we are describing. We had designed supplying these fuel-eaters with a pile of lumber belonging to the Hudson's Bay Company, stored in the premises, but the printers having occupied it in lieu of a table, we have been compelled to postpone indulgence in that (to us) economical expedient. It is possible, also, that the corporation in question might entertain some objections to the proposed use of their property, which objections, although we consider them absurd in view of our necessities, we are bound to respect. The pleasant sounds of wood-sawing, nail-hammering, &c., add to the facilities for editorial labor of which we are now in existing enjoyment, and an occasional procession of Indians cheers and invigorates the writer by stopping and surrounding his locality of labor, and gazing upon his deeds with the expression of intelligence common to the physiognomy of the intellectual race of which they are the representatives."

Compared with the scene of labor of this north-western disciple of Faustus, the Sandwich Islands are ancient seats of civilization; and there accordingly we find, not only the "New Era" and "Argus" the broad-sheet representatives of social and political freedom, but also "The Sandwich Islands' Monthly Magazine," specially devoted to literature, and not altogether neglectful of science. Nor are such evidences of progress limited exclusively to the Islanders of English descent, including those directly from the United States. A paragraph more recent than any of the pages of the Honolulu Monthly which we have, as yet, had an opportunity of perusing, somewhat

oddly combines the evidences of progressive civilisation in the following items:—

"The Minister of the Interior of the Sandwich Islands has officially recommended that the English language, which is already that of the court and of trade, shall be adopted as the national language.—Another Sandwich *trait* worth noticing is the fact of a splendid lace robe for the Prince Royal (Prince of Hawaii) having been procured from Ireland."

We are indebted to our friend, Mr. Joseph Barnard Davis, the learned author of the "*Crania Britannica,*" for the first six numbers of the Honolulu Magazine, as a publication well calculated to gratify those who watch with interest the transformations which external influences effect on rude aboriginal races, and the light thrown on the past history of the human race by watching the phenomena attendant on the meeting of currents so essentially distinct and diverse as those now brought into contact on the remote islands of Polynesia.

The singular phases of thought and of social action thus brought about, alike in the mingling and the conflict of races, cannot fail to arrest attention. Here, for example, is a fragment of the Honolulu editorial address at starting, which presents, in various respects, a striking contrast to that of the *Gazette* of the Fraser River gold regions. Especially noticeable is the very different feeling manifested, in the one case, of regard for the native population, accompanied as it is with the declaration of "respectful loyalty" towards the native king,—compared with the scarcely disguised contempt with which the other looks down upon the degraded and doomed Indians, and seems to anticipate their extirpation along with the forest which he is already converting into *piles of lumber*.

"In giving our opinion," says the Polynesian editor, "on the Men and Measures of the Government of these Islands, we shall bring to the task a profound desire to set forth only the truth, divested as much as possible of all bias or preconceived political ideas; but while avoiding personalities, viewing public men as public property, we shall not scruple to expose their short-comings should they arise, or fail to point out to the best of our ability the true course and policy to be pursued.

To the King recently called to the Throne of these fair Islands, we profess respectful loyalty, admiration for his character, so far as it has yet developed itself, and shall not be found wanting in helping on the good work he has so much at heart, the moral and intellectual elevation of the people over whom he rules. And without the slightest adulation we may say truthfully, that few young men who had had the benefit and advantage of an European education could have entered on his difficult task with better or more decided success.

And now we address ourselves to the task so faintly shadowed forth, and if we

could dip into the future and see "*the vision of the world*," and the effects yet to be wrought out by the various agencies within and around us, what would be the spectacle presented by these Isles of our adoption. Should we see our villages, rising into towns of importance—our towns into large and wealthy cities—our harbors filled with the ships of every nation—our native and foreign population holding equal ground and pursuing together with equal success the paths of happiness, virtue, wealth and intellectual culture—or, should we see the foreigner usurping every position of advantage, and the poor native, his mind uninstructed, his body diseased, his lands sold to meet some temporary want, or to minister to petty vanity, and rapidly disappearing from the soil his fathers cultivated.

We will not dwell now on these speculations, for while writing thus briefly our few introductory words, the delicious Trade Wind is gently stirring our paper—and while all without is glowing in the fervid noon of the Tropics—shade becomes a very paradise—and stretching far away to the horizon, heaves and gently throbs the vast Pacific—the idle waves scarce breaking the usual long white lines on the Coral Reefs—while the feathery leaves of the Cocoa Nut tree are moving gently and gracefully over us. All round us are the Orange, Lime, Pomegranate, Bread Fruit, Banana, Date and Tamarind Trees, with wealth of gorgeous flowers at our feet, while with quiet and gentle steps the natives are gliding stealthily or squatting low to pass round the pipe, and inhaling their two or three whiffs of the fragrant weed."

The contents of the *Sandwich Islands' Magazine* are of an amusingly miscellaneous character. Interesting and instructive ethnological and geological papers lie alongside of such contributions as a "Sonnet to Miss Emma R——," "Eulogy to Queen Pomare," the "Story of a Waltz," "Ode on the Marriage of Kamehameha IV.," &c. Then again we have such practical sheets as "Custom-house Statistics for 1855," "Monthly Summary of Shipping Intelligence," and even a column of "Business Cards," wherein our attention is invited, among lists of Ship Chandlers, Commission Merchants, &c., to the "Honolulu Daguerrean Gallery, King Street, opposite the Globe Hotel," or again, to "the Daguerrean Artist located on Rose Lane, opposite the Bethel, Honolulu." The reviewer next plays his part, and we peruse a well written article under the heading: "*Transactions of the Royal Hawaiian Agricultural Society at its Fifth Annual Meeting, June, 1855. Vol. II. Honolulu: Printed for the Society*;" or, under such headings as "*Report of the Minister of Finance*," or the "*Differential Duties, and their working in Hawaii*," we find ourselves gliding into the troubled waters of Polynesian politics. The Minister of the Interior thus recommends an appropriation "for the purchase or building of a steamboat suitable for our trade, if the Hawaiian Steam Navigation Company fail to fulfil the conditions of their charter":—

"A regular communication with every part of the islands is essential to induce the people to be prepared with their products for market. A boat suited to the trade, and managed with economy, would undoubtedly be a good investment, and I have no doubt that she would be paid for by her earnings in a reasonable time. The general advantages of a frequent communication with all the ports of the group would, I have no doubt, increase very largely our agricultural productions, and render our markets far more attractive. An impulse must be given to labor, and I know of no mode so sure to do it as furnishing a ready means of sale for its products. Much that we raise is perishable, and no communication will answer the purpose so fully as that afforded by steamboats. It is impossible to predict the increased production of fruits, vegetables, &c., which would be induced by a certain and prompt communication with the market. That it will be very great no one can entertain a doubt. Divided, as the kingdom is, into several islands, a steam communication is far more essential than if it were united. I have no doubt that the Government can purchase a boat on its own faith and credit in part, so that a small advance in money would not embarrass the Treasury. Let the boat be insured, and its nett income be made a sinking fund from which to pay the debt, and, I doubt not, it will prove a good investment, and confer general benefits on the island of very great value."

Or listen to our able Honolulu editor on the great educational question as it presents itself to the Hawaiian:—

"In reviewing the merits or demerits of the Minister's budget, we do not intend to touch upon the ephemeral questions which receive from, and impart to, the discussion of politics its chameleon hue; but one item involves principles of justice as well as economy.

"Under the heading of 'Department of Public Instruction,' we find $40,000 appropriated for the support of Common Schools (in the Hawaiian language) and $8,000 for the support of the English schools for natives. In view of such a distribution of the school fund, we would ask the President of the Board of Education, on whom the introduction of the English language among the common people, through special schools for that purpose, has devolved, upon what plan or principle he intends to succeed in this laudable undertaking? How far does all the instruction, of which a Hawaiian school is capable, elevate an intelligent native mind? We will answer, just to that point where 'a little learning becomes a dangerous thing,' and then it leaves him without a chance of further progress. If the President were sincere in his eulogiums on the introduction of the English language, he would have divided the school fund so as to give at least one English school to every district, or more to some of the larger, even if one or more of the Hawaiian schools in each district would have been shut up for that purpose. And less than $25,000 would not secure competent teachers. The pittance of $8,000, now asked for, is trifling with the good disposition of the teachers already in the field and discouraging to other applicants."

The "*Report of the Minister of Foreign Relations!*" next comes

under review, and the reader is almost tempted to smile at the gravity with which the Honolulu critic infers from it :

"That peace and amity reign between this country and 'the rest of mankind;' at least, there are no questions pending likely to assume the important features of a *causus belli*. Our hopes in the continuance of this friendly feeling in the great powers who assisted at our political investiture, is farther strengthened by the fact that they are at last making a naval station of our port for more or less of their Pacific squadrons. Had such a measure been adopted simultaneous with the recognition of our independence, its moral influence would have been incalculable, not only on our foreign relations but also on our domestic progress.

The so long expected treaty with France is apparently not yet completed, seeing that the Minister says not a word about it. It was fondly believed that the legislature of last year had removed the only obstacle to a consummation devoutly wished for, and we have yet to learn that any new misunderstanding has arisen to delay it. But then, diplomacy is a *mare mortuum*, on which the spirit of progress has as yet made no impression. When men or governments approach each other with honesty of purpose and candor of expression, the result cannot long be doubtful; where these postulata are wanting, no result can be satisfactory or lasting."

And thereupon the writer proceeds to address and to warn the Ministers of His Majesty King Kamehameha's Cabinet in relation to the future interests and destinies of the Hawaiian nation, and its young sovereign, and thus concludes :—

"But though empires fall and nations pass away, yet humanity remains ; and as true as the laws which govern it, so sure is there a splendid destiny in store for the isles of the Pacific. Their cycle is just beginning; in several directions the dawn is breaking on their former night, and shall Hawaii ignore her position and her duty in the premises, her share in the result?

"We could wish then that our Ministers would take a loftier, a larger view of the future possible, as well as the present, position and influence of our country, and realize that in more than one sense are we "the heart of the Pacific." It is true that our pulses beat as yet but feebly, but all that we do lack is time and the political sagacity which have conducted other countries to eminence and prosperity. Our statesmen are surrounded with all the materials which go to the making of a beautiful as well as solid mansion ; do they know how to remove their roughness and cement them together? Do they see 'the distant beacons,' and are they steering for them, or do they hang by the moorings of an effete and obsolete past? With the absolute fact before them that "knowledge is power," will they confine that power to an idiom already unable to represent it? With an instinctive conciousness that either the nation or its language must perish, can they hesitate in the choice? With a foreign element daily increasing and daily assuming a more isolated position, because containing all the learning and wealth, which are the only roads to distinction, will they not rather strain every nerve to throw down the barrier which prevents this power from fertilizing the country ; will they not

enable the nation to share this power, and, through the intellectual bond of a common language, secure the sympathy of the good and disarm the malevolence of the designing? Shall there be malevolence or antagonism in the next generation? Will laymen solve the problem which priests in vain essayed?"

The great question, therefore, of the Hawaiian Cabinet and kingdom in 1856 was the reception of the English language as the element of intellectual and social unity with the nation. That question, as we have shown, has since been settled, and the interesting group of islands, comparatively speaking so recently brought within our knowledge, already constitutes an important centre for the further diffusion of the language in which Shakespear and Milton still live for all by whom it is known. Remembering what the British Isles once were, it would be folly to smile at the anticipated destinies of those Isles of the Pacific; but we cannot overlook the part played in all this by "the daily increasing foreign element," to which the Honolulu reviewer refers; and are reminded that when the Celtic Briton first learned the arts of civilization, and shared in the culture and refinement of Roman intellectual progress, our Angle and Saxon ancestors were unknown foreigners, and the English tongue was not yet in being. In the triumph of the Anglo-Saxon in the Isles of the Pacific, as among the wilds of America, it is to be feared that the native race is destined to the same fate as the native language; unless some unheeded island-group supplies for the Polynesian race the same refuge which the mountain fastnesses of Scotland and Wales have done for the Celtic Briton, where, sheltered from the fatal influences of our triumphant progress, they may preserve for other generations the living record of that Archipelago of the Pacific, the discovery of which, in the eighteenth century, stirred the fancy and stimulated the enthusiasm of Europe, with feelings akin to those to which the revelations of Columbus gave rise in the close of the fifteenth century.

D. W.

SCIENTIFIC AND LITERARY NOTES.

PHYSIOLOGY AND NATURAL HISTORY.

CLASSIFICATION OF MAMMALIA, &c.

We transcribe the tabular view of Owen's latest arrangement of Mammalia, from the fifth number of the Journal of the Proceedings of the Linnæan Society, that such of our readers as have it not already before them may be enabled to

compare the views of this great comparative Anatomist with the systems in general use. The groups below the rank of Orders are inserted merely as illustrations of those orders, not as equivalent subdivisions, or as the most natural subdivisions of those orders, into which it has not been the aim of the author on this occasion to enter:

CLASS.	SUB-CLASS.		ORDERS.	
MAMMALIA	Archencephala		Bimana	*Homo.*
	Gyrencephala	Unguiculata	Quadrumana	*Catarrhina. Platyrrhina. Strepsirhina.*
			Carnivora	*Digitigrada. Plantigrada. Pinnigrada.*
		Ungulata	Artiodactyla	*Omnivora. Ruminantia.*
			Perissodactyla	*Solidungula. Multungula.*
			Proboscidia	*Elephas. Dinotherium.*
			Toxodontia	*Toxodon. Nesodon.*
		Mutilata	Sirenia	*Manatus. Halicore.*
			Cetacea	*Delphinidæ. Balænidæ.*
	Lissencephala		Bruta	*Bradypodidæ. Dasypodidæ. Edentura.*
			Cheiroptera	*Frugivora. Insectivora.*
			Insectivora	*Talpidæ. Erinaceidæ. Soricidæ.*
			Rodentia	*Non-claviculata. Claviculata.*
	Lyencephala		Marsupialia	*Rhizophaga. Poëphaga. Carpophaga. Entomophaga.*
			Monotremata	*Echidna. Ornithorhynchus.*

Through the Linnæan Society also Mr. Sclater has communicated his views on the Geographical distribution of the Class Aves, in a paper of great interest (Journal of the proceedings of the Linnæan Society, Nos. 7 and 8) He first divides the Earth's surface into primary kingdoms or provinces. Of these he recognizes six—two in the new and four in the old world · one in each belonging to the Arctic and temperate regions; the other four to the warmer portion. In the North American Province, containing 6¼ million square miles, he finds 650 species. In the South American Province, with 5½ million square miles, 2,250 species. In the Northern portion of the old world, extending from the West of Europe to Japan, and including the basin of the Mediterranean, bounded on the South by Mount Atlas, with 14 million square miles, he finds 650 species. In the Western

Tropical region, including the chief part of Africa, with Madagascar and Arabia, 12 million square miles, give 1250 species. The old world, middle, tropical or Indian Province, has, to four million square miles, 1500 species, and the Australian Province, to three million square miles, has 1000 species. Mr. Sclater does not at present enter upon the subdivision of these great provinces, but in respect to each of them he gives the proportions of the eight orders of Birds, and notes the most characteristic forms. We give his table of families peculiar to the new and to the old world:—

Familæ Neogeanæ sive Novi Orbis.

Todidæ,	*Tyrannidæ,*
Momotidæ,	*Cotingidæ,*
Bucconidæ,	*Rhamphastidæ,*
Galbulidæ,	*Opisthocomidæ,*
Trochilidæ,	*Cracidæ,*
Icteridæ,	*Tinamidæ,*
Caerebidæ,	*Meleagrinæ,*
Formicariidæ,	*Odontophorinæ.*
Dendrocolaptidæ,	

Familiæ Palaeogeanæ sive Orbis Veteris.

Coraciidæ,	*Promeropidæ,*
Eurylaemidæ,	*Muscicapidæ,*
Meropidæ,	*Musophagidæ,*
Upupidæ,	*Coliidæ,*
Bucerotidæ,	*Megapodidæ,*
Sturnidæ.	*Pteroclidæ,*
Paradiseidæ,	*Phasianidæ,*
Meliphagidæ,	*Perdicinæ.*

The same numbers of this valuable journal contain an interesting report on the Botany of the North Australian Expedition, under the command of A. C. Gregory, Esq., by Dr. Ferdinand Müller, Botanist to the Expedition. We may state that 2000 species belonging to 800 genera, and 160 Natural Orders, were observed. Of these, 800 species are new to the Australian Flora, and 500 probably new to Botanical Science. The writer estimates the whole vegetable productions of Australia at 10,000 species. The notes on the useful plants observed are highly interesting, and the choice of a Naturalist to enjoy the advantage of investigating for the first time the Botany of an extensive and important region seems to have been judicious.

Among recent contributions to Physiology and Natural Science, Mr. Nunneley's paper on the structure of the retina, in the Journal of Microscopical Science, should not be overlooked, as it seems to add considerably to the knowledge previously possessed, and to give the results of long series of careful observations of a very difficult kind.

Natural Science has lost another distinguished cultivator in Mr. Dawson

Turner, whose great work on the Fuci is a lasting memorial of his skill and knowledge. He died at a very advanced age.

The twenty-fourth annual report of the Royal Cornwall Polytechnic Society contains several good contributions to Natural Science, especially a paper on the cetacea of the Cornish Coast by Mr. Couch, so well known as an Icthyologist, but from a short paper by the same Naturalist on the wheat midge we judge that this destructive insect is much less known and understood than with us.

Mr. T. Rymer Jones, F.R.S., &c., has produced a volume entitled the Aquarian Naturalist: a manual for the sea-side. It is very highly spoken of as excelling other works of its class, several of which have no small merit, and being illustrated by Tuffen West, and published by VanVoorst, we may be assured that it appears before the public with every advantage.

W. H.

CANADIAN NATURAL HISTORY.

The following remarks have been communicated to the Editor, from the pen of one well qualified from his knowledge of the subjects to which he refers to speak with authority, and the suggestions he throws out cannot fail to be recognized as meriting the attention of those to whom they are addressed. We commend them alike to the consideration of the officers of the Geological Survey, and to the Members of the Canadian Institute who interest themselves in the branches of native science here referred to:—

Why is there not a Zoologist and Botanist attached to the Canadian Geological Survey? is a question that has often occurred to me. And it has recurred with greater force in reading in the May number of the Annals of Natural History, the critique on the "General Report upon the Zoology of the several Pacific Railway Routes. Part 1st. Mammalia."

The critic gives just praise to the American Government, for the Zoological Appendices to the Reports of the various Surveys and Explorations ordered by the Government of the United States, and especially to the work under notice, which he says, "Promises to bring still greater additions to our knowledge of North American Zoology than any of the previous publications."

It appears that the specimens collected by the various expeditions for surveying the routes towards the Pacific were deposited in the Smithsonian Institution, under the care of its officers, that Professor Baird has undertaken and executed the first volume on Mammalia, that Mr. Capin is to take the Birds, and gentlemen learned in the other classes, those to which they have paid the most attention.

So much for the United States; but what has been done by our Canadian Geological Survey for the advancement of the Zoology and Botany of the Province? Absolutely nothing; though their parties have traversed from the heights of Gaspé to far beyond the Northern limits of Lake Huron.

This year they have published a report of their progress for four years, accompanied by a valuable atlas of Charts, which show with what an amount of zeal and

talent the officers of the Survey have worked in their special departments. But while in looking over these Maps, we are struck with astonishment at the amount of labour bestowed on the Map of Geological detail; still there is a feeling of regret, that while such a vast area has been explored so little has been done for the sister sciences. Not that I reflect at all on the Members of the Survey, they have had enough to do in their own departments, but it is a subject for regret that the living organisms have been so entirely overlooked. Surely the expense of a Naturalist with a separate canoe which he would require, would not have added so very considerably to the cost of the Survey, and we should have had now such materials for the elucidation of the Flora and Fauna of the country as can seldom be obtained. Probably these would not differ much from those of the Northern tates of the Union, but now that the local distribution of species is becoming of so much importance for the determination of their Geographical distribution such knowledge would be most valuable. In confirmation of this I quote from the article referred to before:

"The time is now passed when the mere indication of the continent whence an animal has been obtained could satisfy our curiosity. And those Naturalists who have had an opportunity of ascertaining closely the particular circumstances under which the animals they describe are placed in their natural home, are guilty of a gross disregard to the interests of science when they neglect to relate them. Our knowledge of the distribution of animals would be far more extensive and precise than it now is, but for this neglect. *Every new fact relating to the Geographical distribution of the well known species, is as important to science as the discovery of a new species.*"

Were the Canadian Institute to bring this before the Government, they possibly would be induced to lend some assistance to the carrying out of such an object—although the benefit might not be so apparent as in the search after minerals. And possibly among those gentlemen who have turned their attention to these branches of science, some one might be found sufficiently capable, who would not require a very high salary; or, who urged by his zoological ardour might be induced to offer his services, for the payment of the necessary expenses, and the privilege of retaining for himself his duplicates, on depositing a specimen of each species collected, wherever the Government may direct.

MISCELLANEOUS.

THE ATLANTIC TELEGRAPH.

Among the triumphs of Science in the 19th century, we can scarcely anticipate another which shall cast into the shade the successful laying of the great electric cable along the ocean bed of the Atlantic. There appears something of the calm and unostentatious dignity becoming so great an enterprise, in the unheralded announcement of success. Previous failures had prepared all minds for defeat

An unpropitious season confirmed such unfavorable anticipations; so that when, on the 5th of August, the Niagara and the Gorgon sent forth, through all Telegraphic lines of the American Continent, the startling news that they had reached Trinity Bay with their portion of the cable intact, and that on the same memorable 5th of August the Agamemnon communicated, by its means, her completion of her moiety of the work, and the safe arrival of the other end of the cable in Valentia Bay: the general feeling was one of doubt and incredibility.

Time, however, has confirmed beyond all question, the certainty of the great event; and rejoicings of a character scarcely parallelled in modern history have testified to the feelings which it has awakened. The hardy seamen who carried the cable to land, knelt together, and united their voices in prayerful recognition of a Divine and overruling Providence, without whose aid their labor must have been in vain; and the English Board of Directors of the Telegraph Company,—abandoning the wonted matter-of-fact coolness of a joint stock directory,—despatched to the American Board this message, as novel in its form as in its news: EUROPE AND AMERICA ARE UNITED BY TELEGRAPH. GLORY TO GOD IN THE HIGHEST, ON EARTH PEACE, GOOD WILL TOWARDS MEN.

Since the completion of the work was announced, a sufficient number of messages have flashed along the bed of the ocean to prove that the line is capable of being worked with effective accuracy. Some delay must necessarily take place before the communication can be thrown open to the public; but a little impatience is not unnaturally shown at the unavoidable delay; nor does rumor fail, as usual, to put its own construction on the silence. It has even been necessary to give official contradiction to the report that the cable had broken. The possibility either of laying the cable, or of transmitting the electrical current through its vast length of wire, can no longer be discussed; for both have been accomplished. But we must be prepared for unexpected phenomena, such as may baffle all previous telegraphic experience. Twice during the progress of laying the cable, from some hitherto unexplained cause, signals failed to pass between the Niagara and the Agamemnon; viz: for an hour, from 7.30, P. M., on July 29th, and again on August 2nd, from 12.38, A. M., to 5.40, A. M., or for fully five hours. During the whole of the latter period, the gravest apprehensions must have beset the minds of the operators that their labor was once more in vain.

The magneto-electrical current originally proposed to be employed,—and from which we are not aware of any intention to deviate,—is derived from a powerful combination of inducing coils and soft iron magnets. Doubtless when the scientific truths involved in the whole detailed history of this unparallelled triumph of science and persevering enterprise are fully revealed, many facts of singular interest and value will be brought to light.

Civic processions, feasts, and orations, have testified, alike in Britain and America, to the universal sympathy in the joy of those who have accomplished the great feat. Already it has been abundantly, if not adequately celebrated in verse as well as in prose. Among the poetic effusions to which it has given rise, we insert the following, from the pen of a correspondent, whose lines compare favorably with most of the published verse on the same prolific theme:—

Words o'er the Ocean!—Words!
  Words on the Lightning's wing!
For a conjuring cord our Planet girds—
  The arc of a mystic ring.

Thro' old Neptune's wide domain,
  With a Time-out-rivalling rate,
It beareth the thoughts of the busy brain—
  A noiseless—a glorious freight!

Secret, 'neath tidal wave
  It treadeth the trackless main;—
The Spirit Medium stretching afar,—
  The grand Electric Chain!

'Tis done!—at length 'tis done!
  No vain Utopian scheme,
God-like mind hath a triumph won
  Beyond all that the mind could dream.

The Song of the Seraph-Host
  On Judea's plains hath been
Wafted from coast to utmost coast
  By England's righteous Queen.

Hail to thee—bridal clasp!
  Emblem for evermore,
Of the troth 'twixt Britain's rock-bound Isle
  And Columbia's wooded shore!

J. P. H., St. Mary's, Aug. 14, 1858.

It is a fact, not unworthy of note, in the laying of the Atlantic Cable, that its final success, after repeated failures, may be ascribed mainly, if not altogether, to the abandonment of the elaborate machinery designed for regulating the rate at which the cable should be submerged, and literally "giving it its chance." It is also interesting to learn now that the existence of the "Telegraph Plateau," which the Atlantic soundings were supposed to have revealed, proves to be more than doubtful. The reported soundings of Lieutenant Berryman of the United States Navy, when carefully examined, and employed to guage the outline of the Atlantic bottom, reveal no such uniform submarine plain, free from all undulations, as the projectors of the transatlantic telegraph were induced to found on the report of these soundings. Again the soundings made by Lieutenant Dayman, R. N., differ very considerably from those of Lieutenant Berryman, U.S.N.; and it now seems very questionable if either observations can be regarded as more than a very vague and partial approximation to the average depth. Relying, however, on the supposed proofs of a submarine ledge, or great "Telegraph Plateau," extending from the coast of Newfoundland to Ireland, the laying of the Telegraphic Cable has been attempted; and beneath the waves of the Atlantic, the mysterious electric current has already borne its winged messages, swift as thought, from the Old World to the New.

ARCTIC SCENERY.

In noticing in last number (ante p. 367) a disgraceful piece of literary fraud recently perpetrated under the auspices of a Philadelphia publishing house, we were not aware of the full extent of the imposture, and confounded it with the genuine work issued by Messrs. Childs and Peterson, of Philadelphia.

"The spurious "Kane Arctic Expedition" of Messrs. Loyd & Co. of Philadelphia, professes, as we now learn, to have been written by Sontag, one of Kane's officers, whose features the "*enterprising*" publishers endeavored very effectually to adapt to his assigned character, by converting the portrait of a highwayman, from the *National Police Gazette*, into his accredited likeness. The work appears to be characterized throughout by the most shameless effrontery ever embodied in the mercenary frauds of literary forgery. We only notice it now to prevent the confusion of Messrs. Childs and Peterson's genuine work, with that issued by Messrs. Loyd & Co.

ROMAN INSCRIPTIONS IN BRITAIN.

In the paper by the Rev. Dr. McCaul, entitled "Notes on Latin Inscriptions found in Britain," the author suggested a conjectural reading in the letters of the inscription on an altar found at Bath, in 1754, which, if correct, made a very important change in the rendering of the whole inscription. (ante p. 229.) From the following extract from a letter to the author, in reply to his communication of the paper, addressed to him by the Rev. H. M. Scarth, an eminent English antiquary and successful investigator of Anglo-Roman remains, particularly in Somersetshire, it will be seen that the ingenious conjecture has been fully confirmed.

"I this morning received the Canadian Journal (for May, 1858), and having read from *Notes on Latin inscriptions found in Britain*, proceeded to the Literary Institution to verify your conjecture respecting the altar mentioned at page 228."

[The altar, to which reference is made, was found in Upper Stall Street, Bath, in the year 1754, and is at present preserved in the Literary Institution of that City. It is probably about 15 or 16 centuries old.]

"I found your conjecture *perfectly correct*. What had escaped the acumen of Mr. Hunter and other antiquaries, who have from time to time examined the stone, has at the distance of some thousand miles, and in the new world, been read aright by one who has never seen it; so valuable is learned and accurate criticism in the hands of a scholar. It is really

LOVCETIO
MARTI ET
NEMETONA
V. S. L. M.

The L has been read as an I, but it is perfectly plain, when examined closely. There can be no doubt about it."

D. W.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—JUNE, 1858.

Latitude—43 deg. 39.4 min. North. Longitude—79 deg. 21 min. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°. 6 A.M.	2 P.M.	10 P.M.	Mean.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	ME'N	Excess of mean above Average	Tens. of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Result't. Direction.	Velocity of Wind. 6 A.M.	2 P.M.	10 P.M.	Result'.	ME'N	Rain in inches.	Snow in inches.
					°	°	°	°	°												°							
1	29.641	29.680	29.774	29.6833	57.0	71.1	54.5	61.05	+ 4.10	.334	.267	.301	.308	.71	.34	.71	.60	Calm.	W S W	N N W	S 82 W	0.0	12.2	0.5	3.15	4.82	...	...
2	.840	.789	.801	.8083	55.2	71.4	62.8	63.68	+ 5.42	318	332	307	318	73	42	54	57	Calm.	S	N	N 7 E	0.0	5.0	8.5	0.69	3.93	...	...
3	.787	.701	.600	.6867	54.8	63.2	55.0	58.90	+ 1.35	297	267	321	300	69	46	74	61	N	E b N	E N E	N 74 E	1.5	12.0	2.0	8.51	8.61	0.155	...
4	.330	.296	.332	.3030	55.9	71.5	64.9	63.95	+ 6.10	419	558	438	476	94	72	71	80	E b N	S S W	W S W	S 59 W	4.2	12.8	9.8	5.06	8.53	0.515	...
5	.554	.570	.532	.5535	55.9	66.7	56.6	60.10	+ 1.95	364	414	300	353	82	62	65	68	W	S	Calm.	S 7 W	8.0	10.5	0.0	4.11	5.80	0.185	...
6	.430	.433	—	—	54.5	64.8	—	—	—	393	463	—	—	92	75	—	—	E b N	S b W	Calm.	S 58 W	1.8	11.0	0.0	2.35	4.96	0.210	...
7	.639	.536	.723	.6352	58.6	71.1	59.9	63.53	+ 4.78	311	381	290	345	67	49	53	58	S W	S S W	N W b N	S 62 W	2.5	17.0	8.0	5.43	11.19	inap.	...
8	.873	.843	.754	.8208	54.8	63.7	55.9	53.58	− 0.48	260	218	311	271	60	40	70	56	N W b N	S b W	Calm.	S 72 W	8.0	8.0	0.0	1.08	3.84	...	...
9	.702	.637	.557	.6315	56.8	53.9	53.2	54.30	− 5.18	250	231	345	315	54	79	85	75	E b N	E b N	N E b E	N 75 E	2.2	12.2	5.0	6.82	6.92	0.363	...
10	.411	.147	.346	.3018	52.7	63.9	58.4	58.40	− 1.38	378	415	390	418	93	69	80	85	E b N	S E b S	N N W	N 29 W	2.8	8.0	7.3	6.74	8.67	0.785	...
11	.528	.590	.079	.6063	51.8	61.0	52.7	55.85	− 4.13	326	256	247	264	76	47	62	59	N b W	N	N b W	N 1 W	13.8	11.0	14.5	9.12	9.27	...	...
12	.673	.633	.512	.6012	52.7	54.7	53.0	53.08	− 7.18	220	242	264	246	54	56	65	61	N E b N	E	N E b E	N 61 E	7.2	15.0	8.5	9.87	10.73	0.325	...
13	.445	.487	—	—	48.7	53.6	—	—	—	300	308	—	—	87	74	—	—	N b W	N W b N	N W	N 29 W	11.0	11.8	1.5	8.22	8.40	0.005	...
14	.582	.556	.569	.5652	49.8	65.0	53.0	56.68	− 4.15	286	397	305	320	79	64	75	69	N W	S b E	S W	S 7 W	0.5	8.5	0.2	4.22	4.45	...	...
15	.577	.534	.514	.5422	55.5	68.0	52.8	58.23	− 2.88	314	320	304	320	71	47	77	67	S W	S E b S	E	S 55 E	0.2	7.0	0.2	2.20	3.27	...	...
16	.552	.595	.662	.6097	56.6	69.9	64.0	63.38	+ 2.03	345	447	436	411	75	61	73	71	Calm.	S E b S	Calm.	S 17 W	0.0	5.0	0.0	2.04	2.23	inap.	...
17	.733	.645	.625	.6687	64.2	73.6	67.5	68.62	+ 6.97	445	541	504	496	74	65	76	71	S W	S E b S	S W	S	1.2	9.5	2.0	4.45	4.85	...	...
18	.650	.561	.556	.5863	66.6	78.7	67.5	71.05	+ 9.10	504	606	532	555	77	68	79	73	S b W	S b W	S W b S	S 18 W	4.0	11.8	2.0	5.15	5.22	...	...
19	.583	.560	.592	.5803	68.9	81.9	68.9	73.72	+11.58	583	717	618	636	83	65	88	77	S W b S	S	S W b S	S 51 W	1.0	7.2	1.0	2.21	3.96	inap.	...
20	.585	.547	—	—	69.1	82.3	—	—	—	580	630	—	—	81	57	—	—	Calm.	S b W	W N W	S 49 W	0.0	7.5	3.5	2.41	4.36	...	...
21	.607	.542	.606	.5867	63.9	79.9	67.1	71.40	+ 8.93	597	727	593	613	85	71	89	80	N W b N	S b E	N E b E	N 71 E	4.2	6.5	4.0	2.21	4.69	...	...
22	.670	.701	.709	.6960	67.5	74.4	67.3	70.42	+ 7.47	503	611	437	527	76	73	65	71	N	E b S	E	S 87 E	5.0	7.8	3.5	4.28	4.59	...	...
23	.747	.703	.653	.6910	65.3	79.9	69.5	72.70	+ 9.55	482	726	647	617	77	71	90	77	E	S E	E b S	S 66 E	1.0	4.4	0.5	2.26	2.33	...	...
24	.649	.534	.578	.6002	71.6	86.3	75.1	77.85	+14.60	680	725	605	692	85	58	77	78	E b S	S b W	Calm.	S 16 W	1.2	14.2	0.0	4.40	4.73	...	...
25	.584	.523	.542	.5520	73.3	86.1	77.6	78.70	+15.15	719	832	693	736	88	67	73	75	S S W	S b E	N W	S 34 W	0.8	11.8	2.5	3.78	5.18	...	...
26	.577	.583	.610	.5868	76.9	85.0	75.8	79.96	+16.10	702	776	782	760	76	65	88	75	N W	S	S W b S	S 33 W	2.0	6.5	0.5	2.88	3.37	0.450	...
27	.623	.584	—	—	71.1	83.0	—	—	—	699	858	—	—	92	76	—	—	N W b N	S W b S	N b W	N 71 W	2.0	2.2	5.5	1.39	2.82	...	...
28	.626	.615	.631	.6217	71.1	83.7	73.6	77.08	+12.80	625	725	464	617	82	63	56	65	N W b N	S S W	N N W	N 71 W	1.1	5.7	5.6	2.36	4.93	...	...
29	.627	.592	.550	.5900	70.9	81.2	77.6	77.20	+12.75	535	770	568	641	70	73	60	68	N N W	S S E	N	N 52 E	4.5	3.6	4.8	1.27	3.15	...	...
30	.638	.647	.648	.6407	74.0	73.6	68.2	72.30	+ 7.72	572	540	406	580	68	66	72	67	N E b N	E b S	S E	N 87 E	5.5	6.8	4.0	5.64	6.17	...	...
M	29.6000	29.5855	29.6018	29.6037	61.87	72.29	63.53	66.15	+ 5.12	.437	.507	.444	.466	.75	.60	.73	.69	......	......	......	......	3.86	9.92	3.51	......	5.53	1.943	...

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR JUNE.

Highest Barometer........................ 29.891 at 8 a. m., on 8th } Monthly range=
Lowest Barometer .... 29.147 at 2 p. m., on 10th } 0.744

Self-regist'ing Thermom.
- Maximum Temperature............ 90°.2 on p. m. of 25th } Monthly range= 47°.7
- Minimum Temperature............ 42°.5 on a. m., of 14th }
- Mean maximum Temperature .... 73°94 } Mean daily range= 17°.54
- Mean minimum Temperature .... 56°41 }
- Greatest daily range .... 26°.4 from a. m. to p. m. of 2nd.
- Least daily range.................. 4°.8 from a. m. to p. m. of 9th.

Warmest day......... 26th ... Mean temperature......... 79.98 } Difference = 26°90.
Coldest day........... 12th ... Mean temperature......... 53°08 }

Maximum Radiation. { Solar.................................. 103° 0 on p. m. of 26th } Monthly range= 65°0
{ Terrestrial........................ 38°.0 on a. m. of 15th. }

Aurora observed on 4 nights, viz., on 3rd, 7th, 19th and 23rd.
Possible to see Aurora on 20 nights; impossible on 10 nights.

Snowing on days,—depth inches; duration of fall hours.
Raining on 12 days,—depth 2.943 inches; duration of fall 46.8 hours.

Mean of cloudiness = 0.48.
Most cloudy hour observed, 2 p. m., mean = 0.57; least cloudy hour observed 6 a. m., mean, = 0.40.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
1287.17	1455.91	1143.26	1082.01

Resultant direction S. 20° E.; Resultant Velocity 0.25 miles per hour.
Mean velocity........................... 5.53 miles per hour.
Maximum velocity .... 24.5 miles from 11 a. m. to noon, on 7th.
Most windy day......................... 7th...Mean velocity 11.19 miles per hour.
Least windy day .... 16th...Mean velocity 2.23 ditto.
Most windy hour ... 3 to 4 p.m..............Mean velocity 9.16 ditto. } Difference
Least windy hour ... 4 to 5 a. m. ....Mean velocity 2.86 ditto. } 6.30 miles.

Thunderstorms occurred on the 4th from 3 to 4.30 p. m.; 7th, 5.30 to 6.30 p. m.; 9th 10 p. m. to midnight; 10th, 3 to 4 p. m.; 12th, 10 p. m. to midnight; 19th, 2 to 4 p. m., and 27th, 3 to 4 a. m.

Distant Thunder heard on 2nd at noon; 20th, 3 p. m.; 21st, noon; 24th, 5 p. m.; and 26th, 2 to 4 p. m.

Sheet Lightning observed on 3rd at midnight; 7th, 10 p. m. to midnight; 15th, 9 p. m. to midnight; and 25th, at 10 p. m.

Heavy Dew recorded on 13 mornings during the month.

Solar Halo and Parhelia on 8th, from 7 to 8 a. m., and 27th at 9 a. m., very perfect.

Rainbow on the 4th, from 6 to 7 p. m., double and very perfect.

Dense Fog on the 4th at 6 a. m.

A considerable quantity of pollen fell with the rain during the thunderstorm on the morning of the 27th.

The Resultant Direction and Velocity of the Wind for the month of June, from 1848 to 1858, inclusive, were, respectively, West, 0.46 miles.

COMPARATIVE TABLE FOR JUNE.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	M'n.	Diff. from Aver.	Max. ob'd.	Min. ob'd.	Range.	No. of days.	Inch's.	No. of days.	Inch's.	Resultant Direction.	Resultant V'y.	Mean Force or Velocity.
	°	°	°	°	°							
1840	59.8	−1.[illegible]	78.5	37.1	41.4	11	4.860	...	...	...	...	....
1841	65.6	+4.[illegible]	92.8	45.7	47.1	9	1.560	...	...	...	...	0.36 lbs.
1842	55.6	−5.[illegible]	73.9	28.0	45.9	15	5.755	...	...	...	...	0.31
1843	58.4	−3.[illegible]	81.3	28.5	52.8	12	4.595	...	...	...	...	0.27
1844	59.9	−1.[illegible]	82.8	33.1	49.7	9	3.535	...	...	...	...	0.19
1845	61.0	−0.[illegible]	83.6	40.9	42.7	11	3.715	...	...	...	...	0.27
1846	63.3	+1.[illegible]	83.3	41.5	41.8	10	1.920	...	...	...	...	0.32
1847	58.4	−3.[illegible]	78.3	36.7	41.6	14	2.625	...	...	...	...	0.30
1848	62.9	+1.[illegible]	92.5	38.3	54.2	8	1.810	...	...	N 61° W	1.90	4.51 mls.
1849	63.2	+1.[illegible]	84.9	45.2	39.7	7	2.020	...	...	S 71° E	0.49	3.32
1850	64.3	+2.[illegible]	83.2	49.0	34.2	10	3.345	...	...	S 60° W	0.38	4.54
1851	59.2	−2.[illegible]	79.2	41.2	38.0	11	2.695	...	...	S 2° W	1.26	4.42
1852	60.8	−0.[illegible]	86.1	43.6	42.5	10	3.160	...	...	S 76° W	1.49	4.09
1853	65.5	+4.[illegible]	86.3	43.3	43.0	9	1.550	...	...	N 14° W	0.27	3.67
1854	64.1	+2.[illegible]	88.7	47.4	41.3	9	1.460	...	...	N 21° E	0.80	4.12
1855	59.9	−1.[illegible]	90.7	40.6	50.1	17	4.070	...	...	N 69° W	1.33	5.70
1856	62.1	+0.[illegible]	82.6	48.3	34.3	13	3.200	...	...	S 21° W	0.90	5.30
1857	56.9	−4.[illegible]	75.1	40.9	34.2	21	5.060	...	...	N 49° W	1.15	7.60
1858	66.2	+4.[illegible]	86.3	48.7	37.6	12	2.943	...	...	S 20° E	0.25	5.53
M	61.43	...	83.69	40.95	42.74	11.5	3.151	...	...	...	...	4.80 Mls.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST—JULY, 1858.

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 min. 33 sec. West. Elevation above Lake Ontario, 108 feet.

Day	Barom. at temp. of 32°.				Temp. of the Air.				Mean Temp. +or— of the Average	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resultant Direction.	Velocity of Wind.					Rain in Inches.	Snow in Inches.
	6 A.M.	2 P.M.	10 P.M.	MEAN	6 A.M.	2 P.M.	10 P.M.	ME'N		6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.		6 A.M.	2 P.M.	10 P.M.	Re-sul't.	ME'N		
					°	°	°	°	°												°							
1	29.695	29.667	29.566	29.6332	63.5	61.3	61.3	62.10	− 2.67	.291	.350	.317	.326	.49	.65	.58	.58	E N E	E N E	N E b E	N 67 E	8.8	3.4	6.0	7.87	7.94	Inap	...
2	.524	.490	.420	.4690	63.1	70.2	64.4	66.45	+ 1.45	.380	.447	.481	.448	.65	.60	.79	.69	N E	E b N	E	N 63 E	7.0	7.5	0.4	4.12	4.26	0.087	...
3	.363	.302	.383	.3422	64.0	83.2	72.5	73.78	+ 8.63	.546	.725	.607	.644	.92	.64	.76	.79	E	W N W	N W b N	N 50 W	0.5	14.6	10.0	7.56	9.48	0.013	...
4	.462	.582	—	—	68.6	79.8	—	—	—	.446	.510	—	—	.64	.50	—	—	N N W	N W b N	N N W	N 27 W	12.0	19.5	10.0	10.39	10.90	......	...
5	.848	.876	.873	.8738	62.1	68.6	57.5	63.45	− 1.93	.327	.337	.333	.336	.58	.48	.70	.58	N N E	S E	S S E	S 88 E	6.0	9.2	4.0	4.05	6.64	......	...
6	.902	.851	.788	.8377	57.4	72.4	66.4	67.32	+ 1.72	.322	.515	.547	.454	.68	.64	.85	.68	N	S E b S	S E b S	S 66 E	3.2	5.0	0.5	1.42	2.84	......	...
7	.755	.629	.536	.6328	66.9	83.4	74.3	75.45	+ 9.75	.487	.557	.640	.583	.73	.49	.76	.67	N b W	S b E	S b W	S 3 W	1.0	10.0	0.2	3.80	4.65	......	...
8	.510	.466	.528	.5025	75.1	80.7	73.3	75.78	+ 9.98	.646	.689	.647	.653	.75	.65	.79	.73	S b W	S S E	E b N	S 73 E	2.3	4.2	9.8	2.67	5.86	1.300	...
9	.592	.588	.600	.5870	66.4	74.7	66.7	69.73	+ 3.75	.547	.650	.556	.591	.84	.76	.85	.81	N E	E b N	Calm.	N 76 E	1.4	3.7	0.0	2.64	2.67	......	...
10	.538	.532	.613	.5630	71.8	80.8	73.1	75.13	+ 9.05	.667	.814	.630	.690	.86	.77	.78	.79	Calm.	S W b S	N b W	N 76 W	0.0	5.0	4.0	3.52	6.67	0.265	...
11	.696	.719	—	—	64.2	62.8	—	—	—	.445	.401	—	—	.74	.70	—	—	N b W	N N E	N E	N 22 E	11.2	6.8	10.5	9.39	9.60	1.005	...
12	.577	.503	.510	.5252	57.0	59.5	58.6	58.25	− 8.05	.410	.447	.427	.426	.88	.88	.87	.88	N	N N E	N	N 14 E	9.4	9.4	4.0	5.88	6.25	0.747	...
13	.539	.591	.664	.6100	56.8	69.3	63.9	63.90	− 2.48	.409	.495	.476	.465	.88	.69	.79	.78	N N W	S	Calm.	S 71 W	3.5	8.7	0.0	2.03	3.38	......	...
14	.749	.766	.779	.7673	61.3	75.1	63.2	67.63	+ 1.22	.478	.479	.459	.474	.88	.55	.79	.71	Calm.	S b E	E b N	S 47 E	0.0	6.8	0.5	1.50	3.52	......	...
15	.804	.771	.721	.7583	63.5	76.9	65.0	69.43	+ 2.95	.468	.512	.532	.521	.79	.55	.86	.74	E S E	S E b S	Calm.	S 47 E	2.0	3.6	0.0	2.11	2.15	......	...
16	.699	.652	.649	.6663	65.7	76.7	70.6	71.38	+ 4.80	.563	.642	.616	.616	.89	.70	.82	.81	Calm.	S S W	S W b S	S 22 W	0.0	10.2	3.4	3.45	4.43	Inap	...
17	.707	.727	.745	.7247	69.6	72.0	66.0	68.70	+ 2.02	.616	.602	.388	.523	.85	.77	.61	.74	E N E	S S W	N W b N	N 32 W	0.5	5.0	11.2	2.31	5.35	0.075	...
18	.837	.860	—	—	63.1	69.6	—	—	—	.360	.343	—	—	.62	.47	—	—	N b E	S E b S	S E	S 81 E	6.5	9.5	1.0	3.57	4.81	......	...
19	.922	.851	.766	.8408	63.9	75.2	61.7	67.40	+ 0.62	.425	.395	.356	.389	.71	.45	.64	.59	E N E	S E b S	S E	S 78 E	1.0	6.0	2.0	2.56	4.14	......	...
20	.696	.607	.509	.5910	63.5	75.4	62.6	67.70	+ 0.93	.400	.500	.442	.428	.68	.57	.78	.64	N b E	E b S	Calm.	S 53 E	2.1	3.0	0.0	1.08	1.65	......	...
21	.443	.331	.371	.3782	63.1	72.5	64.6	67.57	+ 0.80	.467	.635	.417	.494	.81	.80	.68	.72	Calm.	W	N W	N 72 W	0.0	16.8	7.8	5.41	8.82	0.060	...
22	.487	.493	.517	.4807	65.8	75.1	61.3	66.85	− 0.02	.432	.296	.322	.326	.69	.34	.58	.52	N W	N W	N W b N	N 35 W	13.0	15.4	0.4	8.12	8.26	......	...
23	.529	.523	.605	.5553	57.0	72.2	58.4	63.63	− 3.25	.361	.247	.304	.310	.77	.31	.62	.55	Calm.	N N W	N b W	N 13 W	9.0	11.2	9.0	7.99	8 33	......	...
24	.686	.719	.761	.7252	58.1	67.8	59.0	62.53	− 4.33	.318	.404	.369	.360	.66	.59	.74	.64	N b E	S	S b E	S 56 E	7.6	9.5	2.5	3.54	5.44	......	...
25	.777	.758	—	—	60.0	68.9	—	—	—	.367	.384	—	—	.71	.54	—	—	E b N	E b S	E b S	S 75 E	6.0	8.0	2.0	4.97	5.17	......	...
26	.663	.511	.474	.5393	62.6	79.4	74.3	72.70	+ 5.73	.468	.623	.646	.581	.82	.62	.77	.73	Calm.	S	S W b S	S 20 W	0.0	15.0	4.5	5.37	7.29	......	...
27	.520	.545	.642	.5818	66.4	81.4	65.0	70.90	+ 3.92	.454	.231	.277	.321	.70	.20	.45	.44	W b S	W N W	W b N	N 76 W	7.2	22.6	2.2	10.96	11.10	......	...
28	.736	.758	.651	.7082	57.0	67.5	63.9	64.17	− 2.80	.355	.482	.462	.445	.76	.72	.77	.74	Calm.	S E	Calm.	S 83 E	0.0	0.5	0.0	3.65	4.27	0.120	...
29	.501	.399	.437	.4395	66.2	74.7	64.2	68.82	+ 1.87	.537	.748	.523	.506	.83	.87	.87	.83	E b N	E S E	E	S 88 E	4.0	3.8	10.5	4.57	5.20	Inap	...
30	.425	.441	.489	.4563	61.7	67.7	63.1	63.85	− 3.10	.495	.533	.493	.507	.90	.79	.85	.86	E b N	E S E	N b W	N 42 E	4.6	7.2	0.2	1.50	3.32	Inap	...
31	.516	.544	.572	.5473	60.6	72.2	68.2	67.50	+ 0.55	.441	.512	.432	.471	.83	.64	.66	.69	N N W	S b W	Calm.	N 60 W	4.8	6.6	0.0	1.74	4.13	......	...
M	27.6250	29.5975	29.5969	29.6052	63.32	73.55	65.23	67.80	+ 1.61	.456	.514	.470	.481	.77	.62	.74	.70	......	......	......	......	4.02	8.64	8.70	......	5.70	3.07[illegible]	...

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR JULY, 1858.

Highest Barometer . . . . 29.915 at 8 a.m. on 6th } Monthly range=
Lowest Barometer . . . . 29.290 at 4 p.m. on 3rd } 0.625 inches.

Self-register-ing Ther. { Maximum temperature . . . . 85°0 on p. m. of 8th } Monthly range=
Minimum temperature . . . . 52.0 on a. m. of 6th } 33°0
Mean maximum temperature . . 75°44 } Mean daily range = 15°45
Mean minimum temperature . . 59°98 }
Greatest daily range . . . . 24°6 from a. m. to p. m. on 6th.
Least daily range . . . . 2.1 from a. m. to p. m. on 11th.

Warmest day . . 8th ... Mean Temperature . . . 75°78 } Difference=17°53.
Coldest day . . . . 12th ... Mean Temperature . . . 58°25 }

Maximum Radiation { Solar . . . . 103°2 on p. m. of 8th } Monthly range=
{ Terrestrial . . . . . . 42.5 on a. m. of 28th } 60°7

Aurora observed on 5 nights, viz.: 4th, 5th, 6th 12th and 15th; possible to see Aurora on 19 nights; impossible on 12 nights.

Snowing on 0 days; depth, 0.0 inches; duration of fall 0.0 hours.

Raining on 13 days; depth, 3·072 inches; duration of fall, 31.4 hours.

Mean of cloudiness=0.50; most cloudy hour observed, 2 p. m., mean=0.57: least cloudy hour observed, 10 p. m., mean=0.42.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
1843.03	1034.03	1380.10	1163.29

Resultant direction, N 15° E; Resultant Velocity, 1.13 miles per hour.
Mean velocity of the wind 5.76 miles per hour.
Maximum velocity . . . 29.2 miles per hour, from 11 a.m. to noon on 27th.
Most windy day . . . . 27th—Mean velocity, 11.10 miles per hour.
Least windy day . . . . 20th—Mean velocity, 1.65 do
Most windy hour, 2 to 3 p. m.—Mean velocity, 8·77 do } Difference
Least windy hour, 9 to 10 p. m.—Mean velocity, 3.52 do } 5.25 miles.

Thunderstorms occurred on the 8th from 2 to 4·30 p. m.; 10th, from 11·40 a.m. to 0·20 p. m.; 21st, from 2 to 3 p. m.

Distant Thunder heard on the 14th, from 3 to 4 p. m.; 16th, from 3·30 to 4 p. m.

Sheet and Forked Lightning observed on the 2nd, from 7 p. m.; 3rd, from 5 p. m.; 10th, from 10 p. m.

Heavy Dew recorded on 11 mornings during the month.

3rd. Pollen fell with the rain registered this morning.

21st. Large hailstones fell with the rain during the thunderstorm from 2 to 3 p.m.

25th. Brock's Monument on Queenston Heights distinctly visible to the naked eye at 2 p. m.

The Resultant Direction and Velocity of the Wind for July, from 1848 to 1858 inclusive, were respectively N 65° W, and 0.17 miles.

COMPARATIVE TABLE FOR JULY.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Difference from Average.	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant Direc-tion.	Resultant Velo-city.	Mean Velocity
1840	° 65.8	° — 1.3	° 79.4	° 48.2	° 31.2	6	5.270	...	...	...	...	...
1841	65.0	— 2.1	86.3	43.2	43.1	10	8.150	...	...	...	...	0.27lbs
1842	64.7	— 2.4	90.5	42.0	48.5	4	3.050	...	...	...	...	0.33 "
1843	64.5	— 2.6	86.1	40.2	45.9	8	4.604	...	...	...	...	0.44 "
1844	66.0	— 1.1	86.1	40.5	45.6	12	2.815	...	...	...	...	0.19 "
1845	66.2	— 0.9	94.6	45.6	49.0	7	2.195	...	...	...	...	0.30 "
1846	68.0	+ 0.9	94.0	44.9	49.1	9	2.895	...	...	...	...	0.29 "
1847	68.0	+ 0.9	87.5	43.8	43.7	8	3.355	...	...	...	...	0.19 "
1848	65.5	— 1.6	82.7	46.7	36.0	10	1.890	...	...	N 14 W	0.18	4.94ms
1849	68.4	+ 1.3	89.1	51.0	38.1	4	3.415	...	...	S 5 W	0.75	3.52 "
1850	68.9	+ 1.8	84.9	52.8	32.1	12	5.270	...	...	N 81 E	0.59	4.56 "
1851	65.0	— 2.1	82.7	52.1	30.6	12	3.625	...	...	N 60 W	0.88	4.13 "
1852	66.8	— 0.3	90.1	49.5	40.6	8	4.025	...	...	N 43 W	0.93	3.33 "
1853	65.6	— 1.5	85.4	49.4	36.0	10	0.915	...	...	S 76 E	0.31	3.70 "
1854	72.5	+ 5.4	93.6	53.0	40.6	9	4.805	...	...	S 58 W	0.34	4.26 "
1855	67.9	+ 0.8	88.4	53.1	35.3	13	3.245	...	...	S 19 W	0.73	6.47 "
1856	69.9	+ 2.8	92.0	51.4	40.6	8	1.120	...	...	N 79 W	1.57	5.84 "
1857	67.8	+ 0.7	85.4	52.4	33.0	15	3.475	...	...	S 68 E	0.81	4.74 "
1858	67.9	+ 0.8	83.4	55.9	27.5	13	3.072	...	...	N 15 E	1.13	5.76 "
Mean	67.07	...	87.48	48.19	39.29	9.4	3.536	...	...	...	...	4.66

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—JUNE, 1858.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL. D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32° Fahr.			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind.	Rain in Inches.	Snow in Inches.	WEATHER, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A. M.	2 P. M.	10 P. M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.				6 A.M.	2 P.M.	10 P.M.
1	29.907	29.781	29.840	55.1	80.9	65.6	.400	.484	.388	.84	.46	.63	S b W	S b W	S W	3.12	1.62	3.22	...	...	...	Clear.	Clear.	St. 2.
2	.933	.862	.878	60.6	78.0	63.6	.391	.416	.416	.87	.44	.72	S S W	S S W	S S W	0.20	4.47	4.65	...	...	...	C. St. 6.	C. Str. 2.	Do. 2.
3	30.002	.861	.951	54.0	75.7	61.0	.288	.413	.390	.70	.48	.74	N E b E	E S E	S	4.45	4.26	0.61	...	...	...	Clear.	Clear.	C. St. 8.
4	29.837	.614	.409	53.2	68.1	63.5	.321	.584	.543	.80	.87	.94	E S E	S S W	S S W	0.15	14.90	13.52	...	0.175	...	C. Str. 10.	Nimb 10.	Nimb. 10. Thun.
5	.612	.678	.861	60.7	72.0	62.8	.367	.340	.391	.71	.50	.72	W S W	W S W	W S W	16.05	15.12	7.07	...	...	...	Clear.	Clear.	Clear.
6	.727	.431	.672	54.6	63.6	61.0	.355	.543	.511	.84	.94	.97	S E b S	S E	S W	0.46	0.06	3.22	...	1.136	...	C. Str. 10.	Nimb. 10.	Nimb. 10. Thun.
7	.777	.657	.678	60.9	84.6	72.1	.511	.663	.631	.97	.57	.81	S S W	W S W	W b N	3.96	6.17	11.11	...	Inp.	...	Do. 8.	C. St. 6.	C. St. 7.
8	.842	.815	.874	59.7	70.9	58.0	.323	.423	.372	.65	.59	.78	N N W	W N W	S S W	3.99	8.81	6.98	...	...	...	Clear.	Cirr. 2.	Str. 2.
9	.868	.804	.857	56.1	64.9	56.1	.391	.407	.370	.87	.63	.84	S S W	S S W	S S E	0.00	0.46	1.02	...	...	...	C St. 10.	C. St. 10.	Nimb. 10.
10	.729	.446	.842	57.0	59.2	57.4	.445	.498	.448	.99	.99	.99	S S W	N E b E	N E b E	0.71	3.81	2.22	...	5.775	...	Nimb. 10.	Nimb. 10.	Do. 10. Dist. Th.
11	.592	.674	.834	59.0	62.1	51.1	.410	.347	.270	.82	.64	.72	W N W	W b N	W N W	6.70	8.95	7.60	...	0.400	...	C. St. 9.	C. Str. 6.	Clear. Aur. Bor.
12	.948	.861	.812	50.8	66.1	57.2	.210	.346	.407	.58	.54	.87	N E b E	E S E	S E	6.96	4.05	0.12	...	...	...	Cum. 4	Do. 8.	C. St. 9.
13	.694	.647	.622	54.0	57.0	55.6	.308	.436	.420	.74	.94	.94	E b S	N E b E	E by S	0.72	3.80	1.92	...	0.600	...	C. St. 10.	Nimb. 10.	Do. 8.
14	.887	.679	.797	55.0	65.1	56.4	.411	.483	.420	.97	.78	.94	S b W	S b W	S b E	2.86	4.83	0.83	...	0.100	...	Nimb. 10.	Cir. Str. 6.	Clear.
15	.780	.700	.871	60.5	78.1	60.9	.456	.588	.456	.88	.62	.88	S b W	E b S	S E b S	0.00	1.05	0.17	...	...	...	Clear.	Cirr. 6	Str. 4.
16	.738	.714	.991	55.9	76.1	63.7	.420	.541	.566	.94	.60	.97	S E b S	S	S W b S	0.26	0.09	0.17	...	Inp.	...	Do.	Cir. Str. 9.	Cir. St. 6.
17	.907	.799	.825	61.0	83.0	72.2	.473	.992	.668	.88	.64	.86	S b W	S W	S S W	0.12	2.95	5.27	...	...	...	C. St. 6.	Do. 9.	Do. 9.
18	.816	.603	.842	70.1	92.1	65.2	.551	.908	.463	.74	.60	.78	S W	S W	N E b E	5.31	6.70	7.00	...	Inp.	...	Clear.	Clear.	C. St. 10. D. Th.
19	.892	.755	.800	60.0	69.0	60.9	.374	.496	.473	.73	.70	.89	N E b E	E S E	S S E	3.61	2.62	0.76	...	...	...	C. St. 8.	C. St. 10.	Clear.
20	.744	.689	.715	62.1	81.9	70.2	.491	.664	.557	.88	.62	.77	S S E	S b E	N	0.00	1.53	1.96	...	...	...	Do. 10.	Do. 4.	C. St. 4.
21	.838	.797	.716	65.9	85.1	66.2	.444	.570	.556	.71	.47	.84	S b E	S E b S	S E b S	0.88	0.02	0.16	...	...	...	Clear.	Clear.	Str. 2.
22	.802	.844	.928	76.8	85.4	68.1	.476	.610	.516	.69	.50	.77	N E b E	E S E	S E	0.00	0.00	0.00	...	...	...	Do.	Cir. Str. 4.	Cir. St. 4.
23	.925	.824	.779	58.2	97.0	77.2	.446	.836	.917	.90	.65	.77	E by S	S E	S S E	0.01	0.30	1.02	...	Inp.	...	Cum. Str. 2.	C. C. St. 9.	Cir. Str. 6.
24	.835	.717	.696	74.7	93.8	80.1	.552	.942	.800	.63	.61	.78	S E	S W	E	0.56	4.42	4.18	...	...	...	Cirr. 6.	C. Str. 6.	Do. 8.
25	.710	.582	.699	74.0	96.2	71.9	.680	1053	.745	.81	.62	.95	S S W	S S E	S W	0.23	2.47	3.06	...	0.351	...	C. C. St. 6.	Do. 6.	Nimb. 10.
26	.714	.778	.814	78.0	97.2	79.2	.693	1256	.612	.81	.72	.62	N E b E	N E b E	S S E	0.16	0.22	0.73	...	0.010	...	C. St. 2.	Clear.	Cir. Str. 2.
27	.815	.805	.800	70.5	89.0	78.5	.579	.809	.734	.78	.59	.76	N E b E	E b N	E b N	0.32	0.65	0.02	...	...	...	C. Str. 10.	C. C. St. 8.	Do. 4.
28	.830	.821	.843	74.0	84.4	67.0	.568	.474	.393	.67	.45	.59	N N E	W b N	N N W	0.10	8.05	8.73	...	...	...	Do. 3.	Clear.	Clear.
29	.881	.811	.864	59.5	83.0	62.8	.462	.597	.523	.91	.55	.94	S S E	E S E	E b S	0.86	0.00	4.20	...	Inp.	...	Clear.	C. C. St. 8.	Cir. Str. 4.
30	.777	.792	.834	54.0	75.1	60.3	.282	.628	.456	.67	.73	.88	N N W	W	N	1.41	4.67	4.22	...	...	...	Do.	Clear.	Clear.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—JULY, 1858.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL.D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32°			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind.	Rain in Inches.	Snow in Inches.	WEATHER, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.				6 A.M.	2 P.M.	10 P.M.
1	29.872	29.717	29.823	50.0	76.0	59.2	.258	.470	.352	.71	.52	.70	W b N	S	S W b W	4.32	4.00	6.96	...	...	...	Clear.	Clear.	Clear.
2	.747	.679	.853	54.5	84.4	66.2	.308	.545	.536	.74	.47	.84	S S E	E	E	3.30	0.51	0.32	...	...	...	Do.	Do.	St. 3.
3	.569	.888	.413	68.2	87.0	78.0	.543	.928	.826	.79	.72	.95	S E	S S E	W	0.27	3.37	5.50	...	1.206	...	Cir. Str. 10.	Ni. 10.	Ni. 10.
4	.555	.650	.821	73.7	75.6	59.0	.655	.673	.410	.81	.79	.82	N b E	N E	W N W	1.76	3.36	9.22	...	0.533	...	Clear.	Cir. Str. 8.	Clear.
5	.962	.960	30.035	61.7	73.0	64.4	.383	.588	.497	.71	.74	.83	N	S	S S E	8.88	1.43	1.70	...	...	...	Do.	Clear.	Do.
6	30.052	30.014	29.945	62.8	86.4	69.0	.491	.895	.571	.88	.72	.82	S b W	S b W	S b W	0.32	2.01	4.25	...	...	...	Do.	Do.	Do.
7	29.811	29.655	.792	71.4	91.0	75.4	.615	.1304	.745	.83	.64	.86	S W b S	S b W	S	2.48	8.80	6.06	...	...	...	Do.	Do.	Do.
8	.758	.735	.800	72.1	66.0	58.3	.566	.476	.452	.74	.75	.94	N N E	N N E	N E	7.15	1.40	16.08	...	0.800	...	St. 5.	C. Str. 10.	Ni. 10.
9	.814	.831	.862	58.2	60.9	59.8	.446	.493	.493	.91	.97	.97	N E b E	N E	E N E	17.83	0.37	9.02	...	0.746	...	Ni. 10.	Do. 10.	Cirr. Str. 10.
10	.852	.812	.665	59.0	76.8	70.9	.493	.805	.726	.97	.80	.97	N E	S S E	S	4.40	0.70	1.16	...	0.279	...	C. Str. 10.	St. 8.	Ni. 10 Thundr.
11	.841	.864	.942	60.4	66.7	59.1	.487	.489	.439	.94	.75	.88	N E	N	E N E	9.43	6.06	5.70	...	0.273	...	Ni. 10.	C. Str. 8.	C. Str. 9.
12	.877	.772	.727	54.0	58.2	55.3	.390	.429	.430	.93	.97	.98	N E b E	N E b E	N E b E	9.91	1.40	13.17	...	5.048	...	Ni. 16.	Ni. 10.	Ni. 10 Thundr.
13	.624	.720	.821	59.1	68.2	62.8	.500	.577	.517	1.00	.85	.90	N E b E	S W	S S W	13.30	6.60	7.92	...	1.326	...	Ni. 10.	C. Str. 10.	C. Str. 9.
14	.889	.824	.881	65.9	76.2	64.3	.510	.731	.503	.83	.81	.86	S S W	S S W	W N W	2.68	5.22	5.02	...	...	...	C. Str. 6.	St. 2.	Str. 2.
15	.949	.836	.927	66.2	87.7	69.4	.570	.836	.469	.89	.65	.67	S	S	S S E	0.28	1.98	0.23	...	...	...	Do. 8.	Clear.	C. Str. 2.
16	.861	.779	.785	69.4	80.6	70.9	.599	.843	.658	.84	.83	.90	S	S S E	S S E	0.53	1.40	0.22	...	...	...	C. Str. 8.	C. C. Str. 10.	Do. 6.
17	.916	.758	.898	68.1	86.5	69.2	.612	.850	.536	.90	.68	.77	S W	S W	N b E	0.33	4.26	4.77	...	...	...	Clear.	Clear.	St. 4.
18	30.006	.922	30.082	68.6	80.0	61.1	.463	.557	.442	.77	.77	.83	N N W	N N W	N N W	2.77	1.60	1.05	...	...	...	Do.	Do.	Clear.
19	.011	.914	29.886	63.0	81.2	64.5	.517	.547	.563	.91	.52	.94	N E	S b E	S	0.00	0.02	0.60	...	...	...	Do.	C. Str. 2.	Do.
20	29.821	.858	.716	63.0	84.6	65.4	.498	.746	.583	.91	.64	.94	W b S	S	E b S	0.00	0.00	1.62	...	0.060	...	C. Str. 10.	C. Cir. 6.	C. St. T.-Hail.
21	.610	.485	.500	64.9	90.1	63.0	.583	.887	.549	.94	.63	.97	N E b E	S	E S E	0.22	2.16	3.02	...	0.733	...	Do. 10.	C. Str. 8.	Do. 6 Thundr.
22	.466	.514	.657	61.0	64.4	57.8	.511	.497	.407	.97	.85	.87	E N E	W b N	W b N	0.11	6.51	12.61	...	1.030	...	Do. 10.	Ni. 10.	Do. 10.
23	.665	.658	.889	54.6	67.0	55.8	.362	.406	.405	.87	.77	.92	S W	S S W	S b W	4.51	2.08	13.02	...	...	...	Do. 10.	Cir. Str. 8.	Do. 3.
24	.825	.883	.978	51.3	67.8	59.0	.341	.469	.446	.89	.75	.91	N N E	N E	N E b E	0.11	6.76	9.60	...	...	...	Do. 10.	Cum. 4.	Do. 9.
25	.971	.964	.959	51.9	71.6	61.1	.884	.503	.505	.93	.66	.94	N E b E	S b E	S E b S	3.05	2.81	0.01	...	...	...	Str. 4.	C. C. Str. 6.	Do. 6.
26	.927	.714	.643	55.8	84.2	71.8	.420	.269	.682	.94	.83	.90	S E b S	S E	S E	0.02	1.13	6.15	...	...	...	Do. 2.	C. Str. 6.	Do. 9.
27	.535	.510	.661	70.0	77.9	67.9	.658	.527	.489	.90	.57	.75	S W	W S W	W	0.00	0.08	16.12	...	...	...	C. Str. 4.	Do. 2.	Clear.
28	.814	.892	.864	59.3	73.4	60.1	.416	.506	.505	.85	.62	.94	W S W	W	W S W	16.81	15.82	4.05	...	...	...	Clear.	C. Str. 2.	C. Str. 4.
29	.917	.781	.777	53.4	62.9	57.0	.375	.510	.443	.93	.88	.97	E b S	S E b S	S E	0.12	0.26	0.56	...	Inp.	...	C. Str. 10.	Ni. 10.	Do. 9.
30	.648	.692	.658	51.1	76.8	62.4	.354	.614	.523	.96	.68	.94	E	E b N	S	0.28	0.37	0.22	...	...	...	C. C. Str. 6.	Clear.	Do. 2.
31	.587	.687	.712	60.7	79.1	63.5	.506	.635	.560	.94	.75	.97	S S E	S S W	N	0.00	1.05	0.06	...	0.180	...	Do. 6.	Cir. Str. 10.	Do. 6.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR JUNE.

Barometer	Highest, the 3rd day	30.007
	Lowest, the 10th day	29.342
	Monthly Mean	29.771
	Monthly Range	0.665
Thermometer ...	Highest, the 26th day	97°4
	Lowest, the 12th day	44°4
	Monthly Mean	67°21
	Monthly Range	53°0

Mean of Humidity .... .798

Greatest Intensity of the Sun's Rays .... 108°4

Lowest point of Terrestial Radiation .... 43°2

Amount of Evaporation in inches 2.69

Rain fell on 13 days, amounting to 8.656 inches; it was raining 49 hours, and was accompanied by thunder on 4 days. (From 5 to 6 p.m. on the 10th day there fell 0-933 inches.)

The most prevalent wind was S. E.

The least prevalent wind was N.

The most windy day was the 5th; mean miles per hour, 12.74.

The least windy day was the 22nd; mean miles per hour, 0.00.

Aurora Borealis visible on one night.

The electrical state of the atmosphere has indicated high tension.

Ozone was in moderate quantity.

Fireflies first seen on the 18th day.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR JULY.

Barometer........	Highest, the 18th day	30.059
	Lowest, the 3rd day	29.385
	Monthly Mean	29.739
	Monthly Range	0.674
Thermometer...	Highest, the 7th day	99°.3
	Lowest, the 1st day	41°.3
	Monthly Mean	66°50
	Monthly Range	58°0

Greatest intensity of the Sun's Rays .... 108°.1

Lowest point of Terrestrial Radiation 40.6

Amount of Evaporation (in inches) 3.14

Mean of Humidity .... .818

Rain fell on 13 days amounting to 12.214 inches; it was raining 72 hours 44 minutes, and was accompanied by thunder on 4 days. (The Rivers in this vicinity rose nearly 2 feet on the 13th day, owing to the heavy and continued rain.)

The most prevalent wind was N. E. by E.

The least prevalent wind N.

The most windy day the 28th; mean miles per hour 12.22.

Least windy day the 19th; mean miles per hour 0.20.

The electrical state of the Atmosphere has indicated rather high tension.

Ozone was present in large quantity.

CONTENTS.

***** The Annual Subscription, due in January, Country Members, $3; in Toronto, $4.**

The next Number of this Journal will be issued in November.

THE

CANADIAN JOURNAL

OF

INDUSTRY, SCIENCE, AND ART:

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THE EDITING COMMITTEE OF THE CANADIAN INSTITUTE.

NEW SERIES. NUMBER XVIII.

NOVEMBER, 1858.

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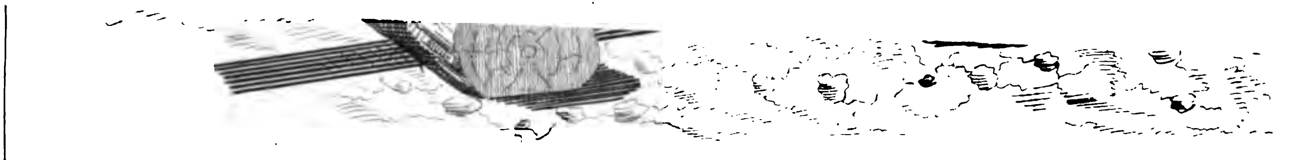
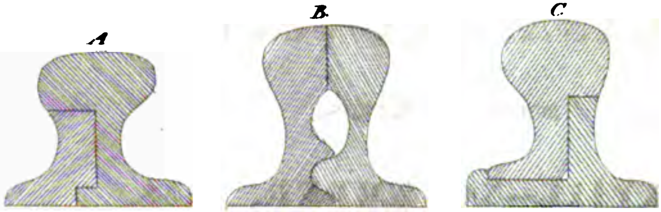
*** *Communications for the Journal to be addressed to the General Editor,* Dr. Wilson, *University College, Toronto.*



Fuller & Bencke Lith Victoria Hall Toronto

Sections of COMPOUND RAILS tried on Various Railways.

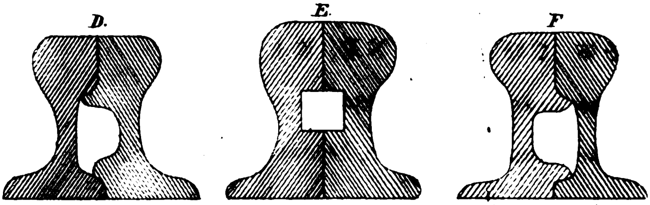
A. B. C.



70 lbs. 78 lbs. 83 lbs.

NEW YORK CENTRAL.
United States

D. E. F.

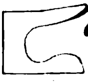


76 lbs. 88 lbs. 70 lbs.

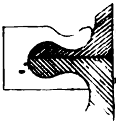
ALBANY NORTHERN. *U. States* TROY UNION. *U. States* GREAT WESTERN. *Canada.*

Drawings of New COMPOUND RAIL see Art page 273.

by Sandford Fleming, C.E.

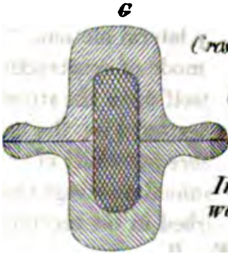


Open Clamp.



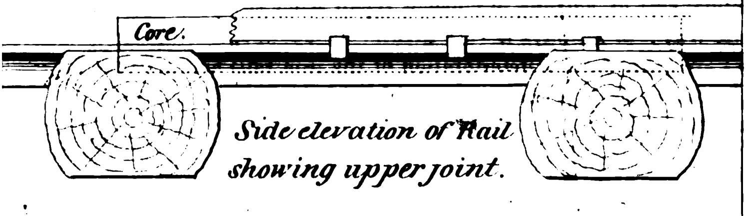
Clamp in use, securing two halves of Rail.

G



Cross Section of Rail.

Weight of each half 36½ lbs.
" of whole Rail 73 "
" of Core 25 "
Including Core, gross weight per yard 80 lbs.



Side elevation of Rail showing upper joint.

Fuller & Bencke Lith Victoria Hall Toronto.

THE CANADIAN JOURNAL.

NEW SERIES.

No. XVIII.—NOVEMBER, 1858.

NEW COMPOUND RAIL.

BY SANDFORD FLEMING, C. E.

Read before the Canadian Institute, February 13th, 1858.

The improvement on railway construction now referred to consists in forming a continuous rail, of uniform strength throughout its length, by means of two light bridge rails, placed the one over the other, and breaking joint. The lower rail is inverted, and rests in grooves cut in the ties or sleepers to receive it; the upper rail is placed immediately over the lower one and secured to it by means of clamps or bolts; wrought iron cores are inserted in the internal cavities at each of the joints, for the double purpose of giving vertical strength and locking the two halves so as to prevent any lateral motion.

The necessity of improving the mode of constructing "The Permanent Way" has doubtless forced itself upon the attention of those who daily witness the care and labour bestowed on the rail track to maintain it in a serviceable state, and more especially of railway proprietors, who too frequently learn at their annual meetings that the earnings of the company are very largely absorbed in the account headed, "Track Repairs" or "Maintenance of Way."

The annual cost of keeping in efficient repair what is termed "The Permanent Way" of railways is very great. It is found, when proper allowances are made for the deterioration of the iron rails and destruction of the ties or sleepers, to amount to about half as much as all the

other expenses of the company. When we consider the large sums necessarily required for repairs of engines and rolling stock generally, repairs of buildings and fences, management, salaries, office and station expenses, fuel, oil and waste, legal expenses, damages, taxes, &c., it appears not a little astonishing that the cost of keeping the iron rails in a proper state of safety and usefulness should bear such a large proportion to the gross expenditure on those various services.

That the maintenance of the permanent way, forming such a heavy charge against the revenue of a company, indicates some defect in its construction, is quite within the bounds of possibility; it at least leaves an opening for enquiry, if not for some improvement, in that portion of a railway which is permanent only in name.

For some years back an endless variety of plans have been invented to render more perfect this essential part of railways. Many of them have been tried with various degrees of success, while not a few have, by common consent, remained the useless property of their originators. The plan now submitted may form an addition to the long list of those last mentioned, although I am not without hopes that on a consideration of the advantages which it appears to possess, it may justify the cost of a practical test, and perhaps be a means not only of enhancing the comfort and safety of railway travellers, but also of assisting in some degree to make railways pay, by reducing the present heavy cost of maintenance.

It is of vast importance to ascertain the weak and defective points of existing systems of "permanent way," since, by so doing, we know where remedies should be applied. Experience shows that the ordinary rail track is defective in one essential principle, inasmuch as its continuity of strength is broken at the ends of every rail bar. The joints being deficient in the requisite strength, they are affected more than other parts of the rail bars by the weight and percussive shocks of passing loads, the ballast underneath yields from the unequal pressure, the chairs and spikes at these points constantly get broken and displaced, and as a consequence the whole track, without frequent inspection and repairs, rapidly becomes deranged. The climate of this country too, I am constrained to believe, tells much more severely on the permanent way, as at present constructed, than it does in England. The frost enters the ground to a great depth, and results at certain seasons in softening the substratum. Thereupon a depression of the ballast under the weight of train, and a vertical work-

ing of the rail ends at the joints take place, in consequence of which the rails are subjected to percussive blows, the chairs not unfrequently are broken, the spikes drawn, and the whole track is liable to be injuriously thrown out of line and level. This circumstance of climate goes to prove the necessity of a more perfect system of permanent way in this country than where the seasons are more temperate. And hence we may account for the otherwise remarkable fact, that America when compared with England has been so much more prolific in compound rails, and similar expedients, to remedy the objections above named.

Amongst other expedients which have been tried to lessen the evils referred to, the application of fishing plates at the joints has been found, when they are kept in perfect order, to answer an excellent purpose. The fishing plates, however, are liable to get deranged, as the bolts by which they are fastened readily become loose through the vibration of the rails, and in this state they are of little service. When this expedient was discussed at a meeting of the Institution of Civil Engineers held last year in England, it was stated that "a recent examination of some brackets and fish plates which had been laid down about twelve months, and were secured by bolts and nuts, showed, that in 125 pairs of joints, each pair having 8 bolts, 261 bolts were loose, and 6 were out altogether, though they had been tightened up within 48 hours. The number of loose bolts at each joint varied from 1 to 8. It was contended, therefore, that bolts and nuts, such as were ordinarily used, were unsafe, inefficient, and expensive fastenings for connecting together the parts of a permanent way, and that they were not to be relied on."

Compound rails of various kinds have been tried of late years on some American roads to overcome the defects of the ordinary rail track. They have been found, when newly laid and in good order, to be remarkably smooth to ride over, and easy on the engines and rolling stock, but as the plan of their construction required that they should be secured with the same description of fastenings as those used with the fishing plates above referred to, they soon got out of order, were difficult and expensive to keep in repair, and are now, I believe, but little used. The Plate shows different patterns of compound rails which have been tried, six on American railways and one on the Great Western in Canada. They are all, with slight modifications, designed after the same general plan, that is, two halves joined together vertically, breaking joint longitudinally, and fastened with bolts and nuts.

It is evident that the joints of these rails, forming as they do a series of long scarfs, must be very much stronger and better than the common chair joints, but still the joints are not so strong as the body of the rails, since at the points where they occur one half only of the sectional area of the rail is solid. If there had been no other objection to these compound rails than the absence of as much strength at the joints as elsewhere, they would, no doubt, be more generally in use than we find them, inasmuch as in them the weak and defective part of the common rail is very materially remedied. Experience, however, has demonstrated that all these patterns of rails are open to serious objections, the most important of which may be stated as being increased first cost over the common rail, excessive cost of maintenance, and too rapid wearing out.

It is evident that these objections may readily be attributed to the plan of construction, as the application of bolts or rivets throughout the entire length of the rail is indispensable to hold the two halves together. As already explained, bolts cannot be relied on, inasmuch as they constantly shake loose, and in this state the stability of the rail is impaired. It is found, too, that rivets for other reasons are perhaps even more objectionable, and whether bolts or rivets are used it is not long before laminated portions of the upper surface of the rail get in between the two plates, and these acting like small wedges, and driven tight by every passing train, gradually open up the rail and hasten its destruction. It is found, moreover, that unless the bolts are properly performing their duty, the whole weight of trains not unfrequently comes on a single half of the rail, producing violent strains which soon tell on the durability of the several parts. For these reasons such compound rails as have been already tried have not proved economical in maintenance, and in consequence have fallen into disuse.

The design of the compound rail now submitted may be executed of any required weight which a heavy traffic might demand. It is thought, however, that a good serviceable rail may be made weighing 80 lbs. per yard including wrought iron cores, the cores themselves weighing 25 lbs., and each half of the rail 36½ lbs. The ties could be grooved by a machine at a trifling cost, and the grooves for both rails could be cut at the same operation; by this means the proper guage of the track would be permanently secured, and the whole superstructure would be laid with the greatest ease and with very little skilled

labour; it would be unnecessary to flatten the ties on any but the lower side, as the machine would form a perfect seat for both rails. The cores may be from 2½ to 3 feet in length, inserted at the joints of both upper and lower half rails, and secured in their position by a small rivet or pin; they would have the same sectional area as each half rail, and being deeper, they would give fully more strength where the joints occurred than the rail possessed at intermediate points.

A permanent way constructed with a compound rail similar in design to the one now submitted may, when put on its trial, have some inherent defects which we cannot at present discover, but in the absence of a practical test, and in ignorance of any strong objection to the plan proposed, I think it may fairly claim the following advantages:

1st. Simplicity of construction and fewness of parts.

2nd. Sufficiency of lateral as well as vertical strength at every point.

3rd. Could be easily laid in perfect guage with little skilled labour.

4th. The rails would be equivalent to continuous bars of uniform strength, and probably would be found more elastic than solid rails.

5th. Great stability, the rails being securely bedded in the ties and their surfaces reduced to the least vertical height practicable above the ballast.

6th. The rails would be thoroughly secured from spreading or displacement.

7th. The track would be smooth to ride over, free from jolts or jars, and easy on the rolling stock.

8th. Economy in cost and maintenance.

Some of these advantages will be readily admitted on a simple inspection of the drawings, others may be inferred from previous explanations, but the last, which is in fact the most important of all, requires some further observations.

Those who have had opportunities of overlooking the operations of the workmen engaged in track repairs must have observed that a great portion of their time is occupied in restoring the injury done to the rail joints, either in removing broken chairs, tightening bolts, or raising the ballast and ties,—indeed at some seasons of the year the most of their time is occupied in raising the joints. With the improved rail

this could not be the case, as practically it has no joints, being of uniform strength throughout its length. In this view of the case I cannot be far astray in estimating, that the improved rail compared with the common rail would not require more than half the number of track men to keep it in repair, and that in this service a saving of not less than $120 per mile would annually be effected.

Again, the ends of the common rail bars laid in the ordinary way, being deficient in strength, are invariably the first portions of the iron to laminate and give way, it may very reasonably be argued that the wearing surface of the improved rail, being equally supported at all points, would not be so much exposed to percussive blows and unequal wear as the common rail, and would, as a natural consequence, last longer. However just this conclusion may be, it will at once be apparent, that the improved rail may undoubtedly claim very much greater durability and usefulness for other reasons. The lower half being an exact counterpart of the upper, by simply inverting both when the wearing surface of the upper is destroyed, we have a fresh surface brought into play, which in all probability may last quite as long as the first. In view of both these circumstances we may, in all fairness, claim that the improved rail will serve its purpose not less than double the period that the common rail would endure, and hence the annual deterioration of the latter should be reckoned as being very much greater than the former. To illustrate the financial value of these advantages possessed by the improved rail, I present an approximate estimate of the annual saving it would effect.

Assuming that the improved rail, including wrought iron cores, weighs 80 lbs. per yard, and that the common rail weighs 65 lbs. per yard exclusive of chairs, the first cost of a rail track constructed with the former will exceed one with the latter by about $800 per mile:

	Annual excess per Mile of Improved Rail over Common.	Annual excess per Mile of Common Rail over Improved.
Annual interest on $800 excess in first cost of improved Rail	$48	
Annual exess of cost of track repairs	....	$120
Annual excess of deterioration of iron rails	....	260
	$48	380
Saving per mile per annum in favor of Improved Rail...	....	$332

It is not pretended that the above estimate is perfectly correct and adapted to every case, as the amount and character of the traffic engaged in by any particular line, as well as the weight of rails used, would affect the calculations. The figures are sufficient, however, to give a comparison between the existing and the proposed system, and to show roughly the commercial value of the latter. Allowing, if need be, one half of the above estimate for unforeseen possible contingencies, we have still a saving of over $180 per mile per annum; a sum which, if reckoned on the mileage of existing Canadian railways, would be equal to a yearly saving of $320,000, sufficient to pay a dividend of 6 per cent. on $5,400,000 of railway capital.

I need scarcely lengthen these observations in order to show that the suggested improvement appears to possess many important advantages, but as the economic test is after all the true financial standard by which such improvements should be measured, I may add, that as the rolling stock is greatly affected by the condition of the track, and the cost of its repairs is proportionate to the state in which the road is kept, we have in this circumstance another element of saving, inasmuch as the improved rail could doubtless be maintained from first to last in a much smoother state than we usually find existing rail tracks.

If still another illustration be needed to show the economic value of the improved rail, it will be seen in the comparative amount of capital required to re-lay the rails after the first set are worn out. For this comparison it matters not what the average life of a common rail may be considered, since we have already shown that the improved rail may be found serviceable for double the period. Let us assume that the life or serviceable duration of a common rail is 8 years, then that of the improved rail may be taken as 16 years,—before the expiration of 8 years the whole of the former has to be renewed, but the latter being reversible, and a worn out surface being equally good for the lower portion, one half of it only has to be replaced before 16 years expire. In the case of the common rail one-eighth of its first cost should annually be set aside out of the company's earnings to replace it in eight years, while only one thirty-second part of the first cost of the improved rail would be needed as an annual sinking fund to renew the wearing surface in sixteen years As a more practical illustration, take a line of railway 200 miles long, and assume the life of a rail as above given, we find, after making ample allowance for the value of the worn out rails as old iron, that the Company would require to expend

in round numbers the sum of $600,000 before eight years expire in running the ordinary rail, while about $300,000 would be sufficient to replace the wearing surface of the improved rail in double the period. In other words, while the renewal of the common rail would prove an annual drain of $75,000 on the earnings of the Company, the improved compound rail would annually draw upon receipts to the extent of from $18,000 to $19,000 only.

It may be observed that the strongest claim which this improvement possesses is, economy in maintenance, and unless this advantage be satisfactorily established the adoption of the system on new or existing lines cannot be hoped for. The fact that railway investments have almost universally turned out profitless to the stockholders, while the public has received and daily receives unmeasured benefits, is a sufficient reason why all improvements in railway construction or in railway management, should have a tendency to distribute the benefits in a more equitable proportion. The public ought not to have a monopoly of them. The parties who invest their capital in railways should have a fair return for their money and their enterprise; indeed it would be infinitely more satisfactory to the thinking public to know and feel that they were in the enjoyment of the most perfect system of internal communication without loss or it may be ruin to the proprietors. Railways must be made to pay, or their extension into unoccupied fields must cease, and thus suspend the progress of modern civilization. Before they can pay one of two things is neceesary, either the receipts must be increased or the expenditure diminished. Experience goes to prove that the amount of traffic which centres in any particular railway is limited by variable local circumstances and the laws of commerce, and beyond this limit the traffic cannot safely be forced; if the earnings cannot be increased beyond what the limit of traffic will allow, then, to make the enterprise pay, a reduction of expenditure must be attempted. In this latter respect it is thought that the change now proposed in the construction of the permanent way has every appearance of being one step in the proper direction, and I avail myself of the facilities furnished by the Canadian Institute for giving such publicity to the proposed plan as may bring it under the notice of those most interested in the removal of the evils which it is designed to avert.

THE ODAHWAH INDIAN LANGUAGE.

BY F. ASSIKINACK,
A WARRIOR OF THE ODAHWAHS.

It is my intention to submit in this paper a few remarks on the language spoken by the above named Tribe of Indians, with the view of showing at least some of the peculiarities in it. On the question whether the languages spoken by the different Tribes in America descend from one common stock, as some writers seem to think, I will not at present undertake to offer any opinion; but I am perfectly satisfied in my own mind that there are Indian Tribes who differ from each other in language as much as the English, French, and German differ from one another in their respective languages. The undermentioned Tribes may be considered as speaking nearly the same language, disagreeing merely in small matters, such as letters, syllables, terminations, and by using in a few instances totally different terms: namely, the Ojibwas, Odahwahs, Omissahgees, (Mississages as they are commonly called), and Odashkwahguhmees. Perhaps the reader may wish to know the reason for my not employing the terms, "*Ottawa*" and "*Chippewa*," in this and my other papers; in answer, I would simply state, that I believe the writers who first made use of these terms, meant to write, *Odahwah* and *Ojibwa*, and having not the slightest doubt that the latter are the correct proper names by which certain Indian Tribes are known in America, I have thought it right to introduce them in these papers for the information of those who may do me the honor to read them. Having made these statements I may now observe that there appear to be twenty-one letters in the Odahwah alphabet. The letters which are wanting, are F, L, R, V and X. From the circumstance of not having these letters in our own tongue, we find great difficulty in pronouncing words where these letters occur, when we commence to learn the English language. Other Tribes appear to be laboring under greater difficulties arising from the deficiency of letters in their alphabet, or rather, the sounds in the language suggestive of corresponding alphabetic signs. The Mohawk Indians, for example, I understand, have only nineteen letters, and no labials at all, and are liable to put B when P should be used; T in place of D; G instead of C; and this defect is noticeable both in their conversation and writings, I mean of course when they make use of the English language.

With respect to the parts of speech, although I am without a guide on the subject, I may venture to say that the Indians have the substantive, the adjective, the verb, the adverb, the pronoun, the conjunction, the interjection, and a sort of a preposition; but they have no article either definite or indefinite. The genders are two, namely, the common and neuter. In Indian, nouns seem to be divided into two classes, viz., nouns without life, if I may be allowed to use the expression, and nouns possessing life. The latter class includes many substances without life, which are nevertheless spoken of as if they possessed life. The former does not contain one single noun possessing life. It is the custom among the Indians to speak of every species of animated nature precisely in the same terms, no matter how small soever the living object may be,—from the largest of quadrupeds to the most insignificant worm or insect, every class of animals may be placed under the heading of common gender, or living nouns. Substances which appear to be capable of motion, growth, or of producing, are generally of the common gender, such as the sun, the moon, the stars, trees, fruit trees and other kinds of vegetables; but those which are without motion or growth, such as land, soil, a stone, a rock, an island, belong commonly speaking to the neuter. Though a tree belongs to the common gender as we have seen above, yet the different parts of it, viz., the branches, bark, roots, leaves, are of the neuter gender. On the other hand some common nouns may be divided and actually taken into parts without any change of the kind; for instance, a corn stock is common, though the ear may be removed from it, and the grain from the ear, yet all these parts would be of the same gender as the whole. I state these particulars in order to give you an idea of the peculiarities of the Indian language.

The plural number is generally formed by adding *g* or *ug* to animate nouns, and *un* to those inanimate; thus, *ahmoo*, a bee, *ahmoog*, bees; *ahnine*, a man, *ahninewug*, men; *minis*, an island, *minisun*, islands. Some few vowel endings only take *g* for the animate, and *n* for the inanimate. There are of course many exceptions.

Taking it for granted that a few specimens of modern compounds will be acceptable, I submit the following, viz., Ahshkoda-naubegwun, a steamboat, from Ahshkoda, a fire, and Naubegwun, a ship; Piwahbikomekun, a railroad, from Piwahbik, iron, and mekun, a road; Tibahkonigawenine, a lawyer, from Tibahkoniga, he gives law, and ahnine, a man; Tibahahkiwenine, a land surveyor, from Tibahiga, he

measures, ahke, land, and ahnine, a man; and I know that the telegraph is called "*Piwahbiconce-madwawag,*" that is to say, *a little iron making a noise.* I hope from the above examples the reader is satisfied that his Indian friends are endeavoring to keep up with the great progress of the age, at least in words, if not materially.

As regards adjectives, I may simply state, that they are employed for the same purpose as in English; but they are not very distinct, and many of them are more like adverbs in composition, such as *bene, male,* in Latin. Thus we say in Indian, Meno-ahnine, a good man; Meno-ahyah, he is well; Meno-dodum, he is doing what is right; and a noun adjective seems always to be incomplete without annexing to it the proper syllable or termination; thus *mahkuhda* evidently means black, though in its modern signification it denotes powder. When it signifies an animal that is black, where in English we should use the verb "*is,*" we are obliged to increase the word by adding one or more syllables; for example, you say in English the bird is black, the Indians would simply say, Mahkuhdaweze; the thing is black, Mahkuhdawah. In many cases adjectives are not used at all, thus, Ahkwa, a woman: Ahkwazans, a little girl: Mitig, a tree: Mitigonce, a small tree. We now come to the verb, and I think the reader will agree with me in the opinion, that Indian verbs present more peculiarities than either Latin or Greek verbs, at least in some respects; they certainly differ widely from the English. In the Indian language, almost every change that takes place in nouns causes a change in the termination of verbs, and it is by means of these terminations that the gender to which nouns belong is shown. Perhaps it would be more correct to say that the genders of nouns affect the terminations of verbs. Before proceeding further, it may be well to give the personal pronouns, which are as follows:

Singular.		Plural.	
Indian.	*English.*	*Indian.*	*English.*
Nin,	I,	Ninahwind and Kinahwind,	We,
Kin,	You,	Kinahwah,	Ye,
Win,	He,	Winahwah.	They.

In the following examples you will perceive no change in the English verb; viz., the man falls, ahnine pungishin; the branch falls, odikwun pungisin. In the first example, the syllable *hin*, shows that *ahnine* is masculine, whilst in the latter, *in*, without the *h*, proves *odikwun* to be of the neuter gender. Again,

SINGULAR.

Masculine,	The man appears....	Ahnine nahgoze.
Neuter,	The island appears ..	Minis nahgwud.

PLURAL.

Masculine,	The men appear	Ahninewug nahgozewug.
Neuter,	The islands appear ..	Minisun nahgwudoon.

Let us take a verb transitive and a common gender; I see a star, Niwahbuhmah ahnung; I see an island, Niwahbundaun minis, *neuter;* Niwahbuhmahg ahnungwug, I see stars; Niwahbundaunun minisun, I see islands.

I give this pipe to you,...... Kiminin mahbah opwahgun.
You give this pipe to me,.... Kimeezh mahbah opwahgun.
He gives this pipe to me,.... Niminig ahnoonduh opwahgunun.

In the last example not only the verb changes, but the demonstrative pronoun used in the first and second persons is no longer available in the third, and *un* is added to the end of the substantive. Sometimes the *n* in the personal pronoun is dropped, as is shown in the above examples; other times it is preserved, and occasionally *d* is put between it and the following word beginning with a vowel; thus, I went, Nin-ge-izhah; I go, Nind-izhah.

The foregoing will show some of the varieties in Indian verbs, yet, notwithstanding these endless variations, insertions and omissions of syllables in the verbs and other words, a stranger will be surprised to hear Indian children speak their language as fluently and correctly as persons in grey hairs.

In order to show that none of the Tribes speak exactly alike, the following will serve as examples, how and wherein they differ:

ODAHWAH.	ENGLISH.	OJIBWA.
Ahnine'..............	A man..............	Enine.
Nibeesh..............	Water..............	Nibe.
Dokisin..............	It is calm..........	Onwahtin.

The Algonquins say, *Naupij* for *very,* Odahwahs, *Ahpidji.* I may here observe that I am informed some of the Tribes west of the Rocky Mountains call the sun *Kesoos,* and the earth, *Ke,* while the Odahwahs call them *Keeis* and *Ahke.* If my information is correct, it would tend to show that there is similarity of words among various Tribes, however distant they may be from one another.

It is also my desire to take notice in this paper of the inaccurate manner in which Indian words are pronounced and spelled by white

people in general, and I hope to be able to show how a wrong spelling may alter a word completely from its original form, and how an incorrect proper name may be repeated and taken as an historical truth after a considerable space of time, especially when the language in which the error originally occurred is not properly understood. By way of beginning, I beg to state that there is a place on the "Ottawa" river called by the Indian, *Mahdahwaun,* while our white friends persist in pronouncing the name, *Matawan.* *Mississippi* is the Indian name of a large river in America. An Indian of my tribe would not have the slightest idea of the original form of this word, although the reader has seen a part of it in the beginning of this article. Our way of writing this name is, *Mashizebe;* it is compounded of *Missi,* which in composition words corresponds to *Michah,* and signifies very great, enormous. The rest of the name speaks for itself, *sebe,* a river.

I shall close this paper by citing another example, and in doing so, will have to criticise the "*Canadian Journal*" itself. In a paper "read before the Canadian Institute on February 14, 1857," the following passages occur,—speaking of Champlain's voyages,—"He ascended the Ottawa beyond the limit of his first journey, till he branched off into the chain of lakes, which led him to the Lake of the Epicerini, or Nebicerini, as later writers call them, an Algonquin Tribe, who were long celebrated for their power as sorcerers, *and whose name we still preserve in that of Lake Nipissing.*" From the above it would appear that "Nipissing" is derived from "Nebicerini"; with all due deference to the learned author, I submit that the very reverse is the case, and that "Nebicerini" is derived from "Nipissing" as much as the name of "Torontonians" is taken from "Toronto." In the first place the spelling in both cases is wrong; Nipissing should be written with b not p, thus *Nibissing,* from the Odahwah word *Nibis,* a small lake. That lake is called Nibissing by way of distinction, being about the largest of the lesser lakes in these parts; in the same way *Mississippi* is applied to the largest river to distinguish it from others. It follows then that the correct form of Nebicerini is *Nibissiwinine.* The term we apply to any one who resides at Nipissing and the country round about is "*Nibissing-dahshi-ahnine,*" i. e., a man belonging to Nibissing; and *Nibissi-ahnine,* and *Nibissinine,* plural, *Nibissininewug,* inhabitants at Nibissing, which I presume "Nebicerini" was meant to represent. The termination *ng* denotes generally *in, at,* so that *Nibissing* signifies *at the little lake.*

DONATI'S COMET.

BY THE REV. JAMES WILLIAMSON, LL.D.,
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The appearance of Donati's Comet excited so much interest during the whole period of its being visible in this latitude, that it may be acceptable to the readers of the *Canadian Journal,* to be put in possession of some of the results of observations made with the aid of the fine instruments in possession of the University of Queen's College, Kingston. These observations have a further interest and value, from the fact that they include an observation a day later than the last on which a similar one was obtained in Britain, and which it may therefore be not unimportant to place on record in our Canadian journal of science.

From the 7th September, when Donati's Comet was first observed here by the naked eye, to the 12th, its tail rapidly increased in magnitude. On the 13th and 14th it pointed nearly in the direction of the Pole-star, while the nucleus was as bright as a star of the first magnitude. On the 17th the Comet was still in the southern part of Ursa Major, with a tail of about 5° in length, pointing between χ and ψ, but nearer to the latter. On the 24th its tail had increased to 8° in length. On the 26th it was a little south of Cor Caroli, with a tail of about 10°, pointing nearly through δ of Ursa Major to the Polestar, and a little concave towards the sun. On October 2nd the tail was 20° in length, and on the 5th the head was about a degree southeast of Arcturus, with a tail of about 32°, which was nearly its maximum length. On the 15th both the nucleus and the tail had rapidly decreased in brightness and the latter also in length, so that it was not much more elongated than when it was first visible to the eye. On the 18th it was scarcely distinguishable by the naked eye, even when its place was known. Although its position, not far above a somewhat hazy horizon, and the moonlight, impeded a distinct view of its appearance through the telescope, it evidently now exhibited only traces of the tail in the winged appearance of the head; and the nucleus, though tolerably round and well defined, was still further diminished in brightness.

The tail was comparatively narrow at first, with the greatest brightness in the centre, and not at the sides, but afterwards increased greatly both in length and in breadth, while a darker portion in the

centre appeared to separate it into two luminous portions. On the 2nd October the coma round the head had become broader, while the nucleus had become brighter. On the 15th the tail, though much fainter and diminished in magnitude, appeared broader and of a more hyperbolic form than before, and the nucleus which was round and pretty well defined on the side away from the sun, exhibited a brighter and more irregular appearance, with flame-like jets, in that portion which was turned towards it.

"The following approximate places were obtained at 7 P. M., on the 13th and 14th September:

	Right Ascension.	Declination North.
13th.........	11h 12′ 35″	36° 32′
14th.........	11h 18′ 24″	36° 33′

From the 13th to the 20th the variation both in Right Ascension and Declination was slow. The following are the places more recently observed, and which may be taken as very nearly correct:

	P. M.	Right Ascension.	Decline.
Sept. 20,	7:00......	11h 48′ 56″.........	36° 20′ N.
" 24,	"	12h 6′ 8″.........	35° 10′
" 25,	"	12h 24′ 39″.........	34° 34′ 30″
Oct. 2,	"	13h 36′ 36″.........	26° 10′
" 5,	6:50......	14h 12′ 50″.........	19° 8′
" 14,	6:31......	15h 58′ 10″.........	10° 44′ S.
" 15,	6:11 47′	16h 8′ 28″.........	13° 48′
" 18,	6:14 30′	16h 37′ 25″.........	21° 51′

The observations were made in the Observatory here with the large equatorially mounted telescope constructed by Mr. Alvan Clarke, the object-glass of which has 6¼ inches of aperture, and of which the Right Ascension reads to four seconds of time, and the Declination Circle to one minute of arc.

The motion of the Comet is, as will be seen from the above, retrograde. The elements of its orbit have not yet been given, so far as we have observed, either in Britain or here: and although three observations, taken at short intervals, are theoretically sufficient for their determination, some time must elapse, and the whole series of observations will require to be taken into consideration before they be fully ascertained, and their accordance with the observed places verified. We know, however, by simple trigonometrical calculation, its nearest distances from the sun and earth, and thence, by micrometrical and

other instrumental measurement, the breadth of the nucleus and coma, and the length of the tail. In its perihelion it passed nearer to the sun than the mean distance of Venus, being a little more than 50,000,000 of miles from the former luminary.

REVIEWS.

Elements of Inorganic Chemistry: By THOMAS GRAHAM. Edited by HENRY WATTS and ROBERT BRIDGES. Lea and Blanchard, Philadelphia, 1858.

Otto's Handbuch der Anorganischen Chemie: VIEWEG und SOHN. Braunschweig, 1855.

It is some years since the first part of Graham's Elements of Chemistry was republished in America, and it is with great pleasure that we have now to notice the appearance of the complete work as issued in very creditable form by Lea and Blanchard, under the editorship of Dr. Bridges, who, although making some valuable additions to the first part of the treatise, does not seem to have added anything to the second; a circumstance which may however be explained, by the great completeness of the original work and by the short period which elapsed between its appearance in England and its re-issue in America.

The present work is issued under the title of "Elements of Inorganic Chemistry," and there does not seem much probability of the organic part being ever published. But from the excellence of the portion before us it must be a matter of regret that Mr. Graham should not be induced to devote his attention to that department also.

All chemists must, however, be deeply grateful to the author for the excellent manual with which he has furnished them, for we have no hesitation in stating, that there is no work in the English language which can for a moment compare with it.

In French (leaving out of consideration the work of Dumas, of which, as far as we know, there is no recent edition,) we have the excellent and tolerably extensive treatise of Regnault, and the still more extensive manual of Fremy and Pelouze, but on a careful comparison we are inclined to give the preference to the work of the British

Chemist. In German we have Gmelin's "Handbuch," which will ever remain a memorial of the almost incredible diligence and ability of its author, a work that as one of reference is unsurpassed in any science. The only book which can compare with and perhaps surpass Graham's is the "Lehrbuch der Anorganischen Chemie," by Otto, formerly known as "Otto Graham's Chemie," being founded on the previous edition of that author's elements, but which has now assumed a form and extension fully entitling it to the position of an independent work. Although it is now some years old, having been completed in 1855, it may not be altogether out of place to say a few words concerning this most excellent publication.

To all lovers of chemistry, and especially to those engaged in the arduous duties of instruction, we cannot sufficiently recommend a perusal of this specimen of German accuracy and completeness. Perhaps the objection may be raised, and not altogether without reason, that the author has rather too great a tendency to diffusiveness. Imagine seventy-five pages of close print on nitric acid, forty-five on phosphoric, and about the same on sulphuric; and yet there is little or nothing that we could desire to see left out. So many various branches of chemical science are treated of, and so much attention is paid to analysis and to technical and toxicological applications, and the first volume of the four, on Heat, Electricity, and Chemical Physics, has been so thoroughly elaborated by Kopp, Zamminer and others, that the work in reality replaces a whole chemical library To the lecturer also it is exceedingly valuable, from the number of excellent hints for the performance of lecture-room experiments.

The "Elements" of Graham, however, if not quite so extensive as the work of Otto, is undoubtedly the most philosophical and instructive treatise on chemistry, in the English language. We have already noticed the first part, as it appeared in its American dress in 1852, and have only now to add, that the recent edition has been brought up to the present state of the science by the carefully compiled and elaborate supplement appended by Mr. H. Watts, the English editor, to whom this second edition owes much of its completeness, and who must share with Graham the commendations awarded to it.

The supplement is very extensive, occupying nearly two hundred pages, and commences with an excellent resumé of the advances made in Heat, Electricity, and Chemical Physics, e. g. Specific Heat, Vapours, Conduction, the dynamical theory of Heat, the application of the

Polarization of Light to chemical investigation, which had not been treated of in the first edition, and which by means of Duboscq's electrical lamp can now be so conveniently made a class experiment and exhibited to a large audience. The elaborate researches of Bunsen and Roscoe on Photo-chemical induction, of Gladstone on Chemical Affinity, of Graham on Osmotic Force, and of Favre and Silzerman on the Heat of Chemical Action, are all, with many others, here reproduced in a condensed form.

In the portion of the supplement devoted to the elements we have a tolerably complete account of that difficult and puzzling question, the nature of Ozone, leaving us at its termination nearly in the same state of uncertainty as at the commencement. Mr. Watts says, "Although the existence of an allotropic modification of oxygen seems to be established, the existence of hydrogen in the ozone obtained by the electrolysis of acidulated water can scarcely be denied." This may be so, but it seems rather difficult to imagine that there can be any difference in composition between substances possessing so precisely identical properties as the two ozones thus obtained; further investigations are required on this subject.

Under the head of the metals of the earths and alkaline earths, we have a full description of the new processes by which these curious bodies have been lately obtained, and by which, for instance, magnesium can be prepared in such quantity and at such moderate expense as to render it available for that most beautiful of all lecture-room experiments, the combustion of magnesium in air or oxygen.

The work, especially the first part, is profusely illustrated with wood engravings, which greatly enhance its value to the student. In looking over the drawings of apparatus for the evolution and absorption of gases, we have been rather struck with an error, or perhaps more correctly an oversight which occurs in several, and to a remarkable apparent misapprehension of the action of safety tubes. We allude to the absence from many of the drawings of the safety tube required to prevent the reflux of the liquid from the washing bottle into the generating flask, and to the erroneous explanation of the action of the wide tube in fig. 138, page 294.

In the well known arrangement for preparing pure hydrochloric acid, the generating flask is furnished with a doubly bent tube (Welter's safety tube), containing a little sulphuric acid, and each of the three-necked bottles has a straight tube passing through the centre neck and

dipping a little into the liquid. If we call the flask A, and the bottles B, C and D, then the straight tube in C prevents the reflux of the liquid from D, caused by a partial vacuum or absorption in C; the tube in B does the same for C, and the bent tube in A allows air to enter if a vacuum be produced in the flask and the wash water rises into the delivery tube, thus preventing reflux from B.

In the work before us, and in many others it is recommended, when we have no three-necked bottles, but only those with two apertures, or when we are compelled to use a cork with two perforations fitted into a wide-mouthed vessel, to insert into one neck or perforation a wide tube dipping into the water, and to pass the gas-delivery tube through this into the liquid. If the above series were arranged in this way, then the wide tube in C would prevent reflux from D, in B from C, but the wide tube in B would have no action in preventing reflux from B into A, that would have to be guarded against by a safety tube attached to the flask itself. And yet we find such an arrangement recommended in Graham's Elements, which by its adoption might frequently lead to very disagreeable if not dangerous consequences, and against which the beginner in practical chemistry cannot be sufficiently warned.

At page 275 we have an apparatus for evolving carbonic oxide from a heated mixture of sulphuric acid and ferrocyanide of potassium (Fownes' process). The flask is without safety tube, but the gas tube passes through a wide one into the washing bottle, which it is clear would not prevent the possibility of the wash water running back into the hot sulphuric acid.

At page 285 we have a similar want of safety tube in the preparation of olefiant gas.

At page 294, fig. 138, the same contrivance is employed in the apparatus for preparing a solution of sulphurous acid, and in the text we read that the washing phial and wide tube serves to "prevent the liquid in the second bottle from passing back into the generating flask, on the occurrence of a contraction of the air in the flask, by cooling or any other cause." It undoubtedly would prevent the return of the water from the second bottle into the first, but not of that in the first into the flask, and by the neglect of the proper precautions in this process very dangerous explosions may sometimes happen, as the writer knows to his cost.

At pages 307, 331 and 333 the same occurs; at 339, 347 and 348 the apparatus is correct, a safety tube being attached to the flask, although in the latter arrangement (348) the use of the wide tube is not very apparent, inasmuch as there is nothing that could possibly flow back under any circumstances.

In looking over the illustrations in the works of Otto, Mitscherlich, Regnault, and Pelouze, we do not find any in which the safety tube is omitted, where a dangerous explosion could possibly take place, and we point out this oversight merely for the purpose of showing how necessary it is, in a work intended for learners, to correct the engravings as carefully as the letterpress.

It is much to be regretted that the treatise before us is confined to inorganic chemistry, if it were continued to the organic department with the same completeness and ability that characterise the present portion, chemists would receive a work of which they are much in need. By the lamented death of Gmelin, his invaluable Handbuch remains incomplete, although it must be confessed that even this excellent work is not free from all objections, inasmuch as his system of arrangement is the most artificial and inconvenient that could possibly be imagined. A reader who is not already a good chemist is left entirely at the mercy of the index when hunting up the history of any compounds. The different organic combinations being arranged in classes according to the number of equivalents of carbon they contain, if he does not remember their composition he cannot know in which group to look for them; such an arrangement being moreover constantly variable with the results of improved analyses or more rational theories. Kolbe's continuation of Otto drags its slow length along, and promises to be completed about the same time as the Catalogue of the British Museum Library. Limpricht's excellent manual has not yet, as far as we know, been translated into English; and we cannot recommend to any aspiring translator, who is well acquainted with the advances of organic chemistry, a more praiseworthy undertaking than to prepare an edition of this small but most excellent work, bringing it up to the present state of the science.

In Mr. Watts' supplement he has very judiciously introduced a chapter on Chemical Notation and Classification, in which a short but comprehensive explanation is given of Gerhardt's unitary system, somewhat like that which forms the introduction to Limpricht's Chemistry. We are not aware of Gerhardt's views having been reproduced

in any English work, as for a long time his theories have been rejected by both English and German chemists. Gradually, however, they are being adopted, and almost every new discovery in organic chemistry tends to prove their truth and their applicability to the explanation of the composition and formation of organic bodies. Berzelius, the great champion of the dualistic system, would be somewhat puzzled to give a rational formula for many of those complex bodies which have rewarded recent investigations, but the composition of which becomes perfectly simple when referred to the types of Gerhardt.

We consider this portion of the supplement as one of the most valuable departments of the whole work.

H. C.

The Story of a Boulder: By ARCHIBALD GEIKIE, of the Geological Survey of Great Britain. Edinburgh: Thomas Constable & Co., 1858.

The literature of Geology may be classed under three heads: first, works of original research, whether in the form of extended treatises, or in that of scientific papers, including reports on unexplored districts, and on the general progress of Geology; secondly, manuals and text-books, embodying a systematic exposition of the facts and theories of the science, or of some special department of it, arranged and displayed according to the ability of the respective authors, in a spirit of greater or less originality; and thirdly, popular essays, in which a scientific and literary treatment of the subject is alike attempted—using these terms in their general sense: the discoveries and deductions of science being here re-produced and set before us, with all the accessories of harmonious language and engaging style. Of these latter works we may take as typycal examples, Hugh Miller's *Testimony of the Rocks*, Ansted's *Ancient World*, and the *Geschichte der Schöpfung* of Professor Burmeister. To this class belongs also Mr. Geikie's "Story of a Boulder;" a little work of much merit, although necessarily, from the nature of its subject, with but slight claims to scientific originality. The student who has carefully read over any of our ordinary manuals,—for example, such as Lyell's Elements of Geology, or the Manual of Professor Phillips—will find in Mr. Geikie's book, little that he will not be already familiar with. A perusal of this unpretending little book, however, cannot fail to

impress the known facts of the science more clearly and definitely upon his memory, and to expand his field of thought; and should the book fall into the hands of one unacquainted with the wondrous histories revealed to us by the teachings of Geology, its agreably-written pages will in all probability add another worker to the ranks of those already engaged in the advancement of this important science. As an example of Mr. Geikie's pleasing and lucid style, we give, entire, the second chapter of his Story of a Boulder; more especially, as this portion of the book admits of direct application to Canadian Geology.

Has the reader, when wandering up the course of a stream, rod in hand perhaps, ever paused at some huge rounded block of gneiss or granite damming up the channel, and puzzled himself for a moment to conjecture how it could get there? Or when rolling along in a railway carriage, through some deep cutting of sand, clay, and gravel, did the question ever obtrude itself how such masses of water-worn material came into existence? Did he ever wonder at the odd position of some huge grey boulder, far away among the hills, arrested as it were on the steep slope of a deep glen, or perched on the edge of a precipitous cliff, as though a push with the hand would hurl it down into the ravine below? Or did he ever watch the operations of the quarryman, and mark, as each spadeful of soil was removed, how the surface of the rock below was all smoothed, and striated, and grooved?

These questions, seemingly simple enough, involve what was wont to be one of the greatest problems of geology, and not many years have elapsed since it was solved. The whole surface of the country was observed to be thickly covered with a series of clays, gravels, and sands, often abounding in rounded masses of rock of all sizes up to several yards in diameter. These deposits were seen to cover all the harder rocks, and to occur in a very irregular manner, sometimes heaped up into great mounds, and sometimes entirely wanting. They were evidently the results of no agency visible now, either on the land or around our coast. They had an appearance rather of tumultuous and violent action, and so it was wisely concluded that they must be traces of the great deluge. The decision had at least this much in its favour, it was thoroughly orthodox, and accordingly received marked approbation, more especially from those who wished well to the young science of geology, but were not altogether sure of its tendencies. But alas! this promising symptom very soon vanished. As observers multiplied, and investigations were carried on in different countries, the truth came out that these clays and gravels were peculiarly a northern formation; that they did not appear to exist in the south of France, Italy, Asia Minor, Syria, and the contiguous countries. If, then, they originated from the rushing of the diluvian waters, these southern lands must have escaped the catastrophe, and the site of the plains of Eden would have to be sought somewhere between the Alps and the North Pole. This, of course, shocked all previous ideas of topography; it was accordingly agreed, at least among more thoughtful men, that with these clays and sands the deluge could have had nothing to do.

Other theories speedily sprang up, endeavouring to account for the phenomena by supposing great bodies of water rushing with terrific force across whole continents, sweeping away the tops of hills, tearing up and dispersing entire geological formations, and strewing the ocean-bottom with scattered debris. But this explanation had the disadvantage of being wofully unphilosophical and not very clearly orthodox. Such debacles did not appear to have ever taken place in any previous geologic era, and experience was against them. Besides, they did not account for some of the most evident characteristics of the phenomena, such as the northern character of the formation, the long parallel striations of the rock surfaces, and the perching of huge boulders on lofty hills, often hundreds of miles distant from the parent rock. Geologists were completely at fault, and the boulder-clay remained a mystery for years.

When we consider the physical aspect of the countries where the question was studied, we cannot much wonder that the truth was so hard to find. In the midst of corn-fields and meadows, one cannot readily realize the fact that the spot where they stand has been the site of a wide-spread sea; and that where now villages and green lanes meet the eye, there once swam the porpoise and the whale, or monsters of a still earlier creation, unwieldy in bulk and uncouth in form. Such changes, however, must have been, for their traces meet us on every hand. We have the sea dashing against our shores, and there seems nothing at all improbable in the assertion that once it dashed against our hill-tops. No one, therefore, has any difficulty in giving such statements his implicit belief. But who could have dreamed that these fields, so warm and sunny, were once sealed in ice, and sunk beneath a sea that was cumbered with many a wandering iceberg? Who could have imagined, that down these glens, now carpeted with heath and harebell, the glacier worked its slow way amid the stillness of perpetual snow? And yet, strange as it may seem, such is the true solution of the problem. The boulder-clay was formed during the slow submergence of our countr- beneath an icy sea, and the rock surfaces owe their polished and striated appearance to the grating across them of sand and stones frozen into the bottom of vast icebergs, that drifted drearily from the north. That we may better see how these results have been effected, let us glance for a little at the phenomena observable in northern latitudes at the present day.

Icebergs are formed in three principal ways:—1st. By glaciers descending to the shore, and being borne seawards by land-winds; 2nd. By river-ice packed during spring, when the upper reaches of the rivers begin to thaw; 3rd. By coast-ice.

I. There is an upper stratum of the atmosphere characterised by intensecold and called the region of perpetual snow. It covers the earth like a great arch, the two ends resting, one on the arctic, the other on the antarctic zone, while the centre, being about 16,000 feet above the sea,* rises directly over the tropics,

* The average height of the snow-line within the tropics is 15,207 feet, but it varies according to the amount of land and sea adjacent, and other causes. Thus, among the Bolivian Andes, owing to the extensive radiation, and the ascending currents of air from the neighbouring plains and valleys, the line stands at a level of 18,000 feet, while, on mountains near Quito, that is, immediately on the equatorial line, the lowest level is 15,795.—See Mrs. Somerville's *Physical Geography*, 4th edit. p. 314.

Wherever a mountain is sufficiently lofty to pierce this upper stratum, its summit is covered with snow, and, as the snow never melts, it is plain that, from the accumulations of fresh snow drifts, the mountain-tops, by gradually increasing in height and width, would become the supporting columns of vast hills of ice, which breaking up at last from their weight and width, would roll down the mountain-sides and cover vast areas of country with a ruin and desolation more terrible than that of any avalanche. Olympus would really be superposed upon Ossa. By a beautiful arrangement this undue growth is prevented, so that the hill-tops never vary much in height above the sea. The cone of ice and snow which covers the higher part of the mountain, sends down into each of the diverging valleys a long sluggish stream of ice, with a motion so slow as to be almost imperceptible. These streams are called glaciers. As they creep down the ravines and gorges, blocks of rock detached by the frosts from the cliffs above, fall on the surface of the ice, and are slowly carried along with it. The bottom also of the glaciers is charged with sand, gravel, and mud, produced by the slow-crushing movement; large rocky masses become eventually worn down into fragments, and the whole surface of the hard rock below is traversed by long parallel grooves and striæ in the direction of the glacier's course. Among the Alps, the lowest point to which the glacier descends is about 8500 feet. There the temperature gets too high to allow of its further progress, and so it slowly melts away, choking up the valleys with piles of rocky fragments called *moraines*, and giving rise to numerous muddy streams that traverse the valleys, uniting at length into great rivers such as the Rhone, which enters the Lake of Geneva, turbid and discoloured with glacial mud.

In higher latitudes, where the lower limit of the snow-line descends to the level of the sea, the glaciers are often seen protruding from the shore, still laden with blocks that have been carried down from valleys far in the interior. The action of storms and tides is sufficient to detach large masses of the ice, which then floats off, and is often wafted for hundreds of miles into temperate regions, where it gradually melts away. Such floating islands are known as icebergs.

II. In climates such as that of Canada, where the winters are very severe, the rivers become solidly frozen over, and, if the frost be intense enough, a cake of ice forms at the bottom. In this way sand, mud, and rocky fragments strewing the banks or the channel of the stream, are firmly enclosed. When spring sets in, and the upper parts of the rivers begin to thaw, the swollen waters burst their wintry integuments, and the ice is then said *to pack*. Layer is pushed over layer, and mass heaped upon mass, until great floes are formed. These have often the most fantastic shapes, and are borne down by the current, dropping, as they go, the mud and boulders, with which they are charged, until they are stranded along some coast line, or melt away in mid-ocean.

III. But icebergs are also produced by the freezing of the water of the ocean. In high latitudes, this takes place when the temperature falls to 28.5° of Fahrenheit. The surface of the sea then parts with its saline ingredients, and takes the form of a sheet of ice, which, by the addition of successive layers, augmented sometimes by snow-drifts, often reaches a height of from thirty to forty feet. On the approach of summer these ice-fields break up, crashing into fragments

with a noise like the thundering of cannon. The disparted portions are then carried towards the equator by currents, and may be encountered by hundreds floating in open sea. Their first form is flat, but, as they travel on, they assume every variety of shape and size.

On the shores of brackish seas, such as the Baltic, or along a coast where the salt water is freshened by streams or snow-drifts from the land, sheets of ice also frequently form during severe frosts. Sand and boulders are thus frozen in, especially where a layer of ice has formed upon the sea-bottom.* The action of gales or tides is sufficient to break up these masses, which are then either driven ashore and frozen in a fresh cake of ice, or blown away to sea. The bergs formed in this way have originally a low flat outline, and may extend as ice fields over an area of many miles, while, at a later time, they may be seen towering precipitously as great hills, some 200 or 300 feet high.

Few sights in nature are more imposing than that of the huge, solitary iceberg, as, regardless alike of wind and tide, it steers its course across the face of the deep, far away from land. Like one of the "Hrim-thursar," or Frost-giants of Scandinavian mythology,† it issues from the portals of the north, armed with great blocks of stone. Proudly it sails on. The waves that dash in foam against its sides shake not the strength of its crystal walls, nor tarnish the sheen of its emerald caves. Sleet and snow, storm and tempest, are its congenial elements. Night falls around, and the stars are reflected tremulously from a thousand peaks, and from the green depths of "caverns measureless to man." Dawn again arises, and the slant rays of the rising sun gleam brightly on every projecting crag and pinnacle, as the berg still floats steadily on; yet, as it gains more southern latitudes, what could not be accomplished by the united fury of the waves, is slowly effected by the mildness of the climate. The floating island becomes gradually shrouded in mist and spume, and streamlets everywhere trickle down its sides, and great crags ever and anon fall with a sullen plunge into the deep. The mass

* I was informed by the late Mr. Hugh Miller, that a seam of shale abounding in liassic fossils, had been found intercalated among the boulder-clay beds in the vicinity of Eathie. He explained its occurrence there by supposing that it had formed a reef along a shore where ground-ice was forming; and so having been firmly frozen in, it was torn up on the breaking of the ice, and deposited at a distance among the mud at the sea-bottom.

† The account of the origin of these giants, as given in the prose *Edda*, is very graphic, and may be not inaptly quoted here:—"When the rivers that are called Elivagar had flowed far from their sources," replied Har, "the venom which they rolled along hardened, as does dross that runs from a furnace, and became ice. When the rivers flowed no longer, and the ice stood still, the vapour arising from the venom gathered over it and froze to rime: and in this manner was formed in Ginnungagap many layers of congealed vapour, piled one over the other."—"That part of Ginnungagap," added Jafnhar, "that lies towards the north, was thus filled with heavy masses of gelid vapour and ice, whilst everywhere within were whirlwinds and fleeting mists. But the southern part of Ginnungagap was lighted by the sparks and flakes that flew into it from Muspellheim. . . . When the heated blast met the gelid vapour, it melted into drops, and, by the might of him who sent the heat, these drops quickened into life, and took a human semblance. The being thus formed was named Ymir, from whom descend the race of the Frost-giants (Hrim-thursar), as it is said in the Völuspá, 'From Vidolph came all witches; from Vilmeith all Wizards; from Svarthöfdi all poison-seekers; and all giants from Ymir.'"—See Mallet's *Northern Antiquities*, edit. Bohn, p. 402.

becoming top-heavy, reels over, exposing to light rocky fragments still firmly imbedded. These, as the ice around them gives way, are dropped one by one into the ocean, until at last the iceberg itself melts away, the mists are dispelled, and sunshine once more rests upon the dimpled face of the deep.* If, however, before this final dissipation, the wandering island should be stranded upon some coast, desolation and gloom are spread over the country for leagues. The sun is obscured, and the air is chilled; the crops will not ripen; and to avoid the horrors of famine, the inhabitants are fain to seek some more genial locality until the ice shall have melted away; and months may elapse before they can return again to their villages.

The iceberg melts away, but not without leaving well-marked traces of its existence. If it disappear in mid-ocean, the mud and boulders, with which it was charged, are scattered athwart the sea-bottom. Blocks of stone may thus be carried across profound abysses, and deposited hundreds of miles from the parent hill: and it should be noticed, that this is the only way, so far as we know, in which such a thing could be effected. Great currents could sweep masses of rock down into deep gulfs, but could not sweep them up again, far less repeat this process for hundreds of miles. Such blocks could only be transported by being lifted up at the one place and set down at the other; and the only agent we know of, capable of carrying such a freight, is the iceberg. In this way, the bed of the sea in northern latitudes must be covered with a thick stratum of mud and sand plentifully interspersed with boulders of all sizes, and its valleys must gradually be filled up as year by year the deposit goes on.

But this is not all. The visible portion of an iceberg is only about one-ninth part of the real bulk of the whole mass, so that if one be seen 100 feet high, its lowest peak may perhaps be away down 800 feet below the waves. Now it is easy to see that such a moving island will often grate across the summit and along the sides of sub-marine hills; and when the lower part of the berg is roughened over with earth and stones, the surface of the rock over which it passes will be torn up and dispersed, or smoothed and striated, while the boulders imbedded in the ice will be striated in turn,

But some icebergs have been seen rising 300 feet over the sea; and these, if their submarine portions sank to the maximum depth, must have reached the enormous total height of 2700 feet—that is, rather higher than the Cheviot Hills.† By such a mass, any rock or mountain-top existing 2400 feet below the surface of the ocean would be polished and grooved, and succeeding bergs depositing mud and boulders upon it, this smoothed surface might be covered up and suffer no change until the ocean-bed should be slowly upheaved to the light of day. In this way, submarine rock surfaces at all depths, from the coast line down to 2000 or 3000 feet, may be scratched and polished, and eventually entombed in mud.

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* That beautiful expression of Æschylus occurs to me, so impossible adequately to clothe in English: *ἀνηριθμον γελασμα κυματων.* Who that has spent a calm summer day upon the sea, has not realized its force and delicate beauty?

† In the *American Journal of Science* for 1843, page 155, mention is made of an iceberg aground on the Great Bank of Newfoundland. The average depth of the water was about 500 feet, and the visible portion of the berg from 50 to 70 feet high, so that its total height must have been little short of 600 feet, of which only a *tenth* part remained above water.

And such has been the origin of the deep clay, which, with its included and accompanying boulders, covers so large a part of our country. When this arctic condition of things began, the land must have been slowly sinking beneath the sea, and so, as years rolled past, higher and yet higher zones of land were brought down to the sea-level, where floating ice, coming from the north-west, stranded upon the rocks, and scored them all over as it grated along. This period of submergence may have continued until even the highest peak of the Grampians disappeared, and, after suffering from the grinding action of ice-freighted rocks, eventually lay buried in mud far down beneath a wide expanse of sea, over which there voyaged whole argosies of bergs. When the process of elevation began, the action of waves and currents would tend greatly to modify the surface of the glacial deposit of mud and boulders, as the ocean-bed slowly rose to the level of the coast line. In some places the muddy envelope was removed, and the subjacent rock laid bare, all polished and grooved. In other localities, currents brought in a continual supply of sand, or washed off the boulder mud and sand, and then re-deposited them in irregular beds; hence resulted those local deposits of stratified sand and gravel so frequently to be seen resting over the boulder clay. At length, by degrees, the land emerged from the sea, yet glaciers still capped its hills and choked its valleys; but eventually a warmer and more genial climate arose, plants and animals, such as those at present amongst us, and some, such as the wolf, no longer extant, were ere long introduced; and eventually, as lord of the whole, man took his place upon the scene.*

It is pleasant to mark, when once the true solution of a difficulty is obtained, how all the discordant elements fall one by one into order, and how every new fact elicited tends to corroborate the conclusion. In some parts of the glacial beds, there occur regular deposits of shells, which must have lived and died in the places where we find them. From ten to fifteen per cent. of them belong to species which are extinct; that is to say, have not been detected living in any sea. Some of them are still inhabitants of the waters around our coasts, but the large majority occur in the northern seas. They are emphatically northern shells, and get smaller in size and fewer in number as they proceed southward, till they disappear altogether. In like manner, the palm, on the other hand, is characteristically a tropical plant. It attains its fullest development in intertropical countries, getting stunted in its progress towards either pole, and ceasing to grow in the open air beyond the thirty-eighth parallel of latitude in the southern hemisphere, and the forty-fifth in the northern. So, too, the ivy, which in our country hangs out its glossy festoons in every woodland, and around the crumbling walls of abbey, and castle, and tower, is nursed in the drawing-rooms of St. Petersburgh as a delicate and favourite exotic. In short, the laws which regulate the habitat of a plant or an animal are about as constant as those which determine its form. There are, indeed, exceptions to both. We may sometimes find a stray vulture

* The reader who wishes to enter more fully into the geological effects of icebergs, should consult the suggestive section on that subject in De la Beche's *Geological Observer*; also the *Principles*, and *Visit to the United States*, of Sir Charles Lyell, with the various authorities referred to by these writers.

from the shores of the Mediterranean gorging itself on sheep and lambs among the wolds of England,* just as we often see

> "A double cherry seeming parted,
> But yet an union in partition;"

or as we hear of a sheep with five legs, and a kid with two heads. But these exceptions, from their comparative rarity, only make the laws more evident. When, therefore, we find, in various parts of our country, beds of shells in such a state of preservation as to lead us to believe that the animals must have lived and died where their remains are now to be seen, we justly infer that the districts where they occur must at one period have been submerged. If the shells belong to fresh-water species, it is plain that they occur on the site of an old lake. If they are marine, we conclude that the localities where they are found—no matter how high above the sea—must formerly have stood greatly lower, so as to form the ocean bed. To proceed one step further. If the shells are of a southern type, that is, if they belong to species† which are known to exist only in warmer seas than our own, we pronounce that at a former period the latitudes of Great Britain must have enjoyed a more temperate and genial climate, so as to allow southern shells to have a wider range northwards. If, on the other hand, they are of an arctic or boreal type, we in the same way infer that our latitudes were once marked by a severer temperature than they now possess, so as to permit northern shells to range farther southwards. This reasoning is strictly correct, and the truth involved forms the basis of all inquiries into the former condition of the earth and its inhabitants.

The evidence furnished by the northern shells in the boulder-clay series is, accordingly, of the most unmistakable kind. These organisms tell us that at the time they lived our country lay sunk beneath a sea, such as that of Iceland and the North Cape, over which many an iceberg must have journeyed, and thus they corroborate our conclusions, derived independently from the deep clay and boulder beds and the striated rock-surfaces, as to the glacial origin of the boulder-clay.

Notwithstanding the length of the above quotation, we are tempted to lay before our readers another extract, in which the ancient impression of a stigmaria-fragment of the coal epoch, is gracefully contrasted with a *fleur-de-lis*, sculptured on the same stone in a long-succeeding although now far-vanished age. In the graphic picture of the decaying palace, with its hall and chapel, and gloomy dungeons, and the ruined fountain of its court-yard, which furnishes the sculptured matrix of the stigmaria for the author's text, we fancy we recognise

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* Two of these birds (*Neophron percnopterus*) are stated to have been seen near Kilve, in Somersetshire, in October, 1825. One was shot, the other escaped.

† There is not a little difficulty in reasoning satisfactorily as to climatical conditions from the distribution of kindred forms. Even in a single genus there may be a wide range of geographical distribution, so that mere generic identity is not always a safe guide. Thus, the elephant now flourishes in tropical countries, but in the glacial period a long-haired species was abundant in the frozen north. I have above restricted myself entirely to *species* whose habits and geographical distribution are already sufficiently known.

the beautiful ruins that reflect their shadow in Linlithgow Loch. The passage altogether constitutes a good example of the general style and subject-treatment of this class of geological writings:

Some time ago I chanced to visit the remains of what had once been a royal residence, and still looked majestic even in decay. It gave a saddened pleasure to thread its winding stairs, and pass dreamily from chamber to hall, and chapel to closet; to stand in its gloomy kitchens, with their huge fire-places, whose blackened sides told of many a roaring fagot that had ruddied merry faces in days long gone by; to creep stealthily into the sombre dungeons, so dank, earthy, and cold, and then winding cautiously back, to emerge into the light of the summer sun. The silent quadrangle had its encircling walls pierced with many a window, some of which had once been richly carved; but their mullions were now sorely wasted, while others, with broken lintels and shattered walls above, seemed only waiting for another storm to hurl them among the roofless chambers below. In the centre of the courtyard stood a ruined fountain. It had been grotesquely ornamented with heads of lions and griffins, and was said to have once run red with wine. But it was silent enough now; the hand of time, and a still surer enemy, the hand of man, had done their worst upon it; its groined arches and foliaged buttresses were broken and gone, and now its shattered beauty stood in meet harmony with the desolation that reigned around. I employed myself for a while in looking over the fragments, marking now the head of some fierce hippogryph, anon the limbs of some mimic knight clad in armour of proof, and ere long I stumbled on a delicately sculptured *fleur-de-lis*, that might have surmounted the toilet-window of some fair one of old. Turning it over, I found its unhewn side exhibited a still more delicately sculptured stigmaria. The incident was certainly simple enough, perhaps even trifling. And yet, occurring in a spot that seemed consecrated to reverie, it awoke a train of pleasant reflection. How wide the interval of time which was bridged across in that sculptured stone! Its one side carried the mind back but a few generations, the other hurried the fancy away over ages and cycles far into the dim shadows of a past eternity. The one told of a land of flowers, musical with the hum of the bee and the chantings of birds, and gladdened by the presence of man; the other told of a land luxuriant, indeed, in strange forms of vegetation—huge club-mosses, tall calamites, and waving ferns—yet buried in a silence that was only broken fitfully by the breeze as it shook the spiky catkins or the giant fronds of the forest. The *fleur-de-lis* recalled memories of France—the sunny land of France—which stood out so brightly in the dreams of our school days; the stigmaria conjured up visions of a land that was never gazed on by human eye, but rolled its rich champaign during the long ages of the Carboniferous era, and sometimes rises up dimly in the dreams of our maturer years. Between these two epochs how many centuries, how many cycles must have slowly rolled away! The *fleur-de-lis* was carved but yesterday; the stigmaria flourished when the earth was young, and had seen scarcely a third part of its known history.

The extracts given above, shew that our author possesses a cultivated taste, combined with descriptive powers of no ordinary kind.

Throughout the volume, moreover, great ability is displayed by the way in which the more important features of the subject are brought out and depicted vividly before the reader. In this, indeed, lies the chief charm and merit of Mr. Geikie's book. We look forward, however, to meet its author at no distant day, in fields of strictly original research, in which alone a lasting reputation is to be obtained.

E. J. C.

The Hand-Book of Toronto; containing its Climate, Geology, Natural History, Educational Institutions, Courts of Law, Municipal Arrangements, &c. &c. By a MEMBER OF THE PRESS. Toronto: Lovell & Gibson, 1858.

The publication of a volume of 272 pages, devoted to the history and description of the Capital City of Upper Canada, must be looked upon as in itself a somewhat significant indication of the rapid progress of this City of the West, and of the Upper Province of Canada, of which it is the Metropolis. The volume, indeed, owes its bulk in part, to chapters not ordinarily included in the City Guide-book. What, it has been asked, has a Geological or a Natural History section, extending to upwards of fifty pages, to do in the Hand-Book of Toronto? And the question would be sufficiently pertinent in reference to any home city of like dimensions and population. But this capital of Upper Canada has been hewn out of the woods, and cleared out of the swamps, within the memory of living men. Its older citizens can remember when the Indian track led through the forest, and they have been scared by the wolf and bear, where now its principal thoroughfares are lined with well-stocked marts, and crowded by a gay and busy throng. Each year witnesses the progress of like changes. We have noted the lingering survivors of the ancient pine forest ejected from enclosed "town lots," and replaced by tasteful villas. The creek to which, only a year or two ago, we were wont to resort of a summer evening to watch the brilliant glancing of the fire-flies, now runs underground through a well built drain; and the stumps of the old clearing have given way to the planking and turnpiking of a city thoroughfare. Nor, with all the rapid progress of a city, now numbering nearly 8,000 dwellings and upwards of 50,000 inhabitants, is the natural history of Toronto entirely a thing of the past.

It might, indeed, be assumed from some of our author's remarks, that we are still in a considerably more primitive state, in relation to vulpine and ursine neighbourship, than recent experience would justify. After a detailed list of Canadian flora, the author thus proceeds :—

"The Fauna of the neighborhood has no doubt been considerably modified by the progress of civilization, or at least by the clearing of the forest. The Wolf and the Bear, and other large animals so frequently met with by the early settler, are now seldom seen except by the lumberman, whose store of bacon lures them to his hut. Now and again, indeed, one or other of these ferocious animals, impelled by hunger, or allured by the scent of prey, strays beyond the line marked by civilization, and finds, when too late, that it has wandered too near the haunts of its relentless enemy, man. Of several of the orders of mammals, we have no representatives here."

In other cases, however, the Canadian settler extends his courtesy to the old denizens of the woods, and welcomes them to the new seat of civilisation. The sociable House Wren (*Troglodytes domestica*), and also the Purple Martin (*Hirundo purpurea*), add to our migratory city population, along with other summer visitors, and find apartments prepared for them as welcome southern tourists :—

"This interesting and beautiful bird is so much a favorite in consequence of its social character, that it is no uncommon thing for persons to prepare it a place of abode during its brief sojourn. Hundreds of little boxes are stuck up on long poles in the gardens throughout the city, where these wanderers annually find a resting place, and a temporary home after their long flight."

Of the New York Bats (*Vespertilio Noveboracensis*) our Hand-Book informs us :—

"In the winter of 1854, Mr. Couper, Entomologist, found one of these bats asleep one forenoon suspended by the feet from the branch of a tree in the Homewood Estate. He stuffed it and sent it to the celebrated Naturalist, L. Agassiz, to whom it was of the utmost importance, for it enabled him to correct an error into which he had fallen in regard to the geographical range of this species. He had set it down as ranging no farther north than the Middle States; yet here it was apparently at home, a little north of Carlton Street."

So of the Sand Martin (*Hirundo riparia*). We learn that the sand banks near the Toronto Necropolis contain large colonies of them. And of the beautiful little Blue-eyed Yellow Warbler (*Mniotilta aestiva*) :—

"Great numbers of them may be seen in the gardens in the upper part of the city, among the shrubs and fruit trees, and sometimes in the streets, unmindful of the bustle and din of a crowded thoroughfare. For many summers past they

have frequented in great numbers a large willow tree in Yonge street, nearly opposite Gerrard street, and always appeared most sprightly and joyful when there was any extra stir on the street."

The only unpleasant additions to such paragraphs of civic natural history are notes of information, that Mr. May *shot upwards of fifty beautiful and delicate little humming birds during the past summer;* or, that, of the Whip-poor-Will, whose plaintive cry is heard throughout the whole summer's night: "During the present season a large number of them have been shot in our neighborhood." Do our citizens indulge in Whip-poor-Will pies, and Humming Bird tartlets? or are these feats of mis-called sport mere exhibitions of wanton destructiveness? We learn indeed some curious hints of gastronomic tastes. We grow our own turtles. Indeed Toronto Aldermen have a choice in this respect, adapted to very varied tastes, from the Snapping Turtle, which takes a lesurely meal of a duck, to the Mud Terrapin, or Stinkpot: very abundant if not too savoury. Here are a couple of notes for our Canadian Meg Dods, which must close our notice of the city's *Natural* History:—

"The Bull Frog (*Rana pipiens*), attains to a very large size, measuring from six to seven inches in length, and having a corresponding corpulency. The hind legs (when cooked) are white, tender, and excellent eating. Some specimens weigh half a pound."

"The Spring Frog (*Rana fontinalis*) is the species which is so much esteemed as a delicacy, although I am not aware that that nicely adjusted Epicurean taste which would so peculiarly relish either Spring Frogs, or that other Imperial dish, 'Peacock's brains,' is much cultivated in Torónto."

The founder of the City of Toronto was Lieutenant-Governor Simcoe, an Officer who had seen service in the American war, and a Member of the House of Commons in 1791, when Canada was divided into the Upper and Lower Provinces. When, in the following year, the new Governor entered on his duties the population of the entire Province numbered little more than a third of the present inhabitants of Toronto, and its first Parliament, consisting of an Upper House of eight Members, and a Lower House, or Legislative Assembly, of only double that number, met at Niagara, or Newark, as the most populous village of the Upper Province was then called. It is impossible to look back without feelings of lively interest on this miniature reproduction in our first western clearing, of the old Saxon institutions of British freedom:

"The next point of importance for the Governor's consideration was the selection of a Seat of Government, a question at all times seemingly surrounded with diffi-

culties. Lord Dorchester had his Head Quarters at Quebec, the only place then considered capable of defence; and he would appear to have demanded that Kingston should be selected as the capital of Upper Canada, a settlement having already been made there. But Governor Simcoe had a mind and a *will* of his own, which neither the greater proximity to Quebec, nor the convenience of obtaining orders and news more rapidly from Europe, which Kingston presented, could influence; and as Newark lay within range of the American Fort on the opposite bank of the river, and was not, therefore, the most appropriate place, he fixed upon the site on which Toronto now stands, as the scene of his future administrative operations, and carried out his determination irrespective of the opposition which he had to encounter.

"From the arrangements and plans which the Governor formed, the development of the resources of the country seems to have been the leading idea in his mind, and undoubtedly the magnificent harbour formed by nature at the very point at which he looked for an outlet to the trade of the north, was not the least attractive feature in the rude scene which presented itself to his keen scrutinising eye, as he made his selection of this spot as his capital. Colonel Bouchette, Surveyor General of Lower Canada, and then engaged in the naval service of the Lakes was selected to make the first survey of the harbour of York, as the place was then named by Governor Simcoe. In looking back upon that time (1793) he says: 'I still distinctly recollect the untamed aspect which the country exhibited when first I entered the beautiful basin which then became the scene of my early hydrographical operations. Dense and trackless forests lined the margin of the Lake, and reflected their inverted images on its glassy surface. The wandering savage had constructed his ephemeral habitation beneath their luxuriant foliage—the group then consisting of two families of Mississaguas—and the Bay and neighboring marshes were the hitherto uninvaded haunts of immense coveys of wild fowl. In the spring following the Lieutenant-Governor removed to the site of the new capital, attended by the Regiment of Queen's Rangers, and commenced at once the realization of his favorite project.'

"The building of the Town of York may be said to have commenced in 1794, under all the disadvantages which an unhealthy locality, described as better fitted 'for a frog pond or a beaver meadow than for the residence of human beings, would necessarily present. The spot which the Governor selected for his own residence was on the high ground north of the old Don and Danforth Road, overlooking the 'flats' or valley of the Don—decidedly the most romantic and picturesque spot in the vicinity of Toronto. The log-house in which he established himself, and which was named Castle Frank,—after one of the members of his family,—was destroyed by fire upwards of thirty years ago;' but the residence of Mr. Francis Cayley, erected near the site of the old castle, still bears, and very appropriately, the name of Castle Frank."

From this initial stage of Toronto, or York, as it was then styled, our author traces its history onward, through various successive stages of prosperity and adversity, to its condition in 1857, when the little Village of York had grown to the City of Toronto, with real pro-

perty valued by the assessors of that year at £7,288,150, besides City corporation property estimated at £430,418, and personal property valued at £1,296,616. Many interesting glimpses of the ups and downs of our Canadian Capital fill up the interval between its birth in 1793 and this recent stage of its growth in 1857.

Passing on, for example, to 1811, we find the clearing widening, roads extending, and houses multiplying; though the farmers complained still of the stumps, and swamps, and pitfalls through which they had to thread their way to the infant capital. Two actual *brick houses* are even on record prior to 1812, when war broke out. But in the following year the defenceless town was taken, the public buildings were burnt, and the fire-engine carried off as a trophy of such gallant deeds. This somewhat curious war-trophy, commemorative of the heroes who, on the 13th of October, 1813, fired the poor little village and ran away with its only fire-engine, is, it seems, "now kept by the United States Government in the Navy Yard." Our author thinks that the President of the United States should be respectfully requested to return the engine; but it is surely unreasonable to expect him to part with so glorious a prize.

The following extract will give an idea of our author's more ambitious style, when he escapes beyond the plodding details of statistics into the regions of poetical fancy, toned down with a dash of severe critical reflection. His subject is:

OUR SOCIAL STATE.

"It is perhaps as well to admit at the outset, that there is felt now and again the slightest possible deficiency in that geniality of disposition and temperament,—that hearty cordiality of manner,—which some older communities manifest. It is in point of fact often broadly stated that the people of Toronto are not by any means so social as they might be; with them the enjoyment of the social affections, that

'Mysterious cement of the soul,'

is cramped by formality and chilled by etiquette, and, even at its best estate, is very exclusive. We admit that, to the casual observer, this may be the case, and first impressions are not at all times easily erased, but that apparently ungenial temperament is undoubtedly the result of deeper and more sacred mental communings than those to which it is generally attributed. It may justly be ascribed, less to any inherent or acquired snobbishness of feeling which makes some men think that they are something

'Above the common level of their kind,'

than to the fact that our population is not only but of yesterday,—it is also very fluctuating. True, genuine, perennial sociality is a plant of slow growth, and can

only flourish in certain stages of society. The people who have snapped asunder all the ties of kindred, who have done violence to all the fond endearing associations which bound them with romantic enthusiasm to the place of their birth,—the hearths and the homes of their sires,—and have been rocked on the wide ocean that they might seek a home in the far west,—cannot again for years enjoy that elasticity of spirit, nor that sense of fixedness which form a basis for the cultivation of warm, lasting friendship. They have made one change, and they know not how soon they may make another; and any feelings of sociality with them is but a fitful, transient gleam of the sunshine of the soul bursting through those endearing memories which link them so inseparably to the joys, the sorrows, and the early associations of their Fatherland,—

> 'Tis evanescent, fleeting, transient,
> As the thin, fleecy clouds, which float around
> The setting sun's ethereal temple,
> As through the gorgeous golden peristyle,
> Paved with enamelled radiance, he retires
> Amidst the dazzling splendors of his own
> Refulgent beams.

Or if they succeed in business here, and have the prospect of permanency before them, the social feelings are too often kept subservient to the one grand aim of acquiring wealth and a name, in the land of their adoption. Whatever, therefore, does not either directly or incidentally conduce to this absorbing desire is left in abeyance until a more convenient season, and thus a state of mind is gradually superinduced, the very antithesis of sociality in its broad expansive sense."

Biographical notices of distinguished, singular, or notorious characters always constitute a piquant element in local histories, and such have not been entirely omitted here; though we doubt not our author has still more recherche materials in reserve for future editions. His slighter marginal sketches are meanwhile full of character. An analysis of the materials of which the Council of Public Instruction is composed occurs on page 123, and there we have such a sketch of a member, dressed in a little, but not *brief*, authority: his conduct being, in our author's estimation, one of the evils incident to a life-appointment to such a Board:—"It gives some members an opportunity to assume dictatorial airs, as if they alone were the wise, and wisdom would die with them;" as is accordingly exemplified in the Member's treatment of "a thoroughly educated and spirited young gentleman." The absence of specific individuality here is calculated to add an agreeable mystery to the portraiture; the reader having before him on the same page the list of Right Reverends, Reverends, Honorables, and Esquires, composing the Board which includes the embodiment of dictatorial airs and wisdom so flatteringly sketched off in this H.B. style. Which of all the Hon. and Rev. conclave can it possibly be?

Where it is better calculated, however, to add to the effect of the sketch, our author knows well how to give a more specific verisimilitude, as is shewn in another little penciling,—in this case of an editorial celebrity. Charles Lamb's odd tastes and sympathies put him in love with the Chimney Sweeps, and led to his penning his lament "On the Decay of Beggars" in the British Metropolis. An opposite grief, however, weighed down the heart of a Toronto Daily editor, who decries the beggar's calling with undisguised animosity as an intollerable nuisance; complains that in this our good city of Toronto beggary has assumed the dignity of a craft, and so proceeds thus: "To tolerate mendicancy is a false philanthrophy. It is to nurture the germs of every vice that ever adorned the gallows—it is to commit a sin against the youthful poor, and to neglect the duty we owe to our neighbor and to ourselves." Whereupon our author thus sketches off his brother of the Press: "This is putting the matter in a somewhat broad light, but it may be perfectly orthodox in so far as the personal experience of the editor of the 'Colonist' is concerned, for he is rather complaisant and benevolent looking, dresses well, and very tastefully, and is just such a person as that shrewd and wily class would be ready to pounce upon with a certainty of success."

But the most elaborate of the biographical sketches introduced into the "Hand Book of Toronto," is that of the Venerable Bishop of the Diocese, and in introducing this, one little paragraph occurs, which, from its richness in suggestions of what might have been, peculiarly tempts our fancy:

"We have already," says the author, "referred to the fact that Governor Simcoe, who seems to have been a prudent, self-reliant, liberal-minded gentleman, urged upon the Home Government in 1792 the propriety of establishing a University at the Seat of Government, that the youth of the province might enjoy the benefits of a sound education. With a view to prepare for such an institution, he gave authority to the Hon. Richard Cartwright and the Hon. Robert Hamilton to secure 'a gentleman from Scotland to organise and take charge of the College or University which he purposed to establish.' These gentlemen applied to their friends in Scotland to select a suitable person, and they fixed upon Mr. Thomas Chalmers, then completing his theological studies at St. Andrew's, but Mr. Chalmers having declined the offer, it was subsequently accepted by Mr. John Strachan, then parochial schoolmaster in the parish of King's Kettle, Fifeshire."

The distinguished position ultimately attained by the gentleman thus selected, and the enduring influence he has exercised over the Province, in some of the most important elements of its develop-

ment, must give his name a very prominent place in the history, not only of Toronto, but of Canada. But we are more impressed in the above passage with the name of a college companion of him who subsequently became Bishop of Toronto. Our author, indeed, mentions *a Mr. Thomas Chalmers* here, without noticing that he was any one out of the common order of probationers or theological students at the ancient Scottish University. But is there any doubt that it is *the* Thomas Chalmers?—that Scotland actually ran this risk of losing the foremost among all the men of the first half of her nineteenth century; and that Canada missed this chance of gaining him? Had the young student of St. Andrew's undertaken the organization and charge of the Provincial University, Scotland's modern history would certainly have been different from what it is; nor, we imagine, would Canada's have been altogether the same. In glancing over the biography, to which the above paragraph is the introduction, we fancy to ourselves our Canadian Thomas Chalmers becoming Rector of York, and next Archdeacon Thomas, and then Thomas of the Executive Council, and finally Thomas Toronto, sole Bishop of the Province; and all things taking their shape from his vigorous intellect and indomitable energy, as they have done in many ways from the vigor and energy of him who accepted the important trust in 1778, and still survives in honored age among the Toronto citizens of 1858.

The histories of old cities are full of suggestive reminiscences and lively incidents of biography and character, and we thus see that the City of Toronto has also its incidents and reminiscences already gathering around a youth full of enterprise and promise for the future.

D. W.

The Canadian Almanac, and Repository of Useful Knowledge, for the year 1859. Toronto: Maclear & Co., 1858.

This highly useful work, which has now reached its twelfth year of publication, is more easy to turn to good practical use than to review. It abounds with valuable matter, presented to the reader in the most condensed form, and embraces, as its title sets forth, full and authentic commercial, statistical, astronomical, departmental, ecclesiastical, educational, financial, and general information. Having said so much

for itself, the reviewer is somewhat puzzled to say more. It is no slight commendation to say, that what it thus sets forth on its own account is no empty boast; but its careful digest of multifarious information is better suited for reference and consultation, than for extracting. One subject, however, of universal interest at present, is treated here in a style that invites, as well as admits of quotation, and that is the financial crisis of 1857-8. The recurrence of such panics at nearly regular intervals of eight or ten years for a century past, has naturally attracted the attention of political economists, and led to many attempts at solving the causes, and thereby discovering the cure for an evil, which involves so much suffering, and renders the progress of the world's trade and commerce so intermittent and uncertain. The writer, in the present instance, wisely deals with the evil historically, rather than theoretically, though; as it will be seen, with a reasonable freedom in the use of figures of speech, as well as figures of arithmetic:

"The crisis of 1857 fell like a 'thunderbolt' on the commercial world. The mania for speedy riches had so blinded the public mind, that the dangers which were accumulating on every side, were unperceived or uncared for, till our whole commercial and monetary systems were involved in one common chaos, from which they are only yet slowly emerging.

"Scarcely had the abundant harvest of the South and West been secured, when the failure of a large banking establishment in Ohio with its principal agency in New York alarmed the public mind. On the 24th of August, 1857, the Ohio Life and Trust Company closed its doors. The connection of this large Institution with other minor concerns soon brought these to a stand, and the alarm, aided and increased by the Electric Telegraph, soon became general. A feeling of universal insecurity created a desire to realize, and the best securities depreciated in value. Those *step children*, called Bank notes, which are never welcome to the paternal roof, flocked home in thousands, like unwelcome visitors at the most inopportune moment. Discounts were contracted, and merchants, manufacturers and business men generally who had large payments to make, yielded to the pressure. Stocks fell to an unprecedentedly low figure, and exchange became unsaleable. The loss of confidence so essential to commercial activity became after all the great cause of nine-tenths of the evils resulting from the crisis. Houses of undoubted standing were looked upon with distrust. Ample means was no security against failure. The Banker looked upon the merchant's paper with suspicion, and the merchant looked upon the Bank notes with equal distrust. The poorer classes surrounded the Banks, and in their eagerness to save themselves from loss, withdrew the precious metals, an act which was speedily to deprive them of their daily bread. Deprived of the basis of their circulation the Banks curtailed their discounts, workshops and factories were closed, and thousands of industrious workmen in the principal cities of the United States were thrown out of employment. Meantime

the United States country Banks (of which there are over 1000) suspended in dozens, the Banks in Philadelphia followed suit; and on the thirteenth of October several New York Banks gave way. On the next day, by general agreement, the whole New York City Banks (except the Chemical) suspended specie payment. The turning point was now reached and men began to breathe freely. The notes of the great majority of the United States Banks being secured by stocks passed freely, and for nearly two months scarcely a Bank in the United States paid specie at its counter.

From the United States the panic passed to England and the continent of Europe. At first it was thought that England could stand the shock without serious difficulty, but the intimate relations which bind commercial nations together had not been accorded their due importance. Houses in the American trade began to give way and in their fall involved others in ruin. Banking houses of long standing toppled down side by side with the wild speculator or reckless adventurer. The fair fame of Scottish banking was stained by the failure of one of the principal Banking Institutions under circumstances so discreditable as to throw even the *wild cat* banking of our western neighbors in the shade. An institution with seven and-a-half millions of dollars of paid up capital, and thirty millions of deposits became hopelessly insolvent, and caused, it is said, an amount of suffering in Scotland greater than that entailed upon the country by the Russian War."

Favoured as we have long been in many respects, in Canada, it was impossible that we could be mere idle or uninterested onlookers during a crisis which made itself felt throughout the whole civilized world. Nevertheless there have not been wanting just grounds for congratulation. When after reviewing the disasters and sufferings of other countries we turn to our own Province, we learn with feelings of pride and satisfaction, that while an universal suspension of specie payment existed in the neighbouring States, and even travelling was for a time clogged by the difficulty of obtaining change at one resting place, which would pass current beyond the next stage; and when the American Bankers were collecting our Bank notes over a frontier of a thousand miles, and demanding specie at every Bank counter: nevertheless our Canadian Banks conducted their issues as usual, paid specie on demand, and retained public confidence uninterruptedly to the close of the panic, and the resumption of specie payments by the United States Banks. How is this to be accounted for, and why is it that after thus triumphantly maintaining our credit before the world, we now suffer under a depression, worse to many than the crash which visited the neighbouring States?

"We must not [directly] attribute the prostration of business in 1858 to the panic of 1857. Canada lost comparatively little by the crisis. She was a debtor not a creditor, both as regards England and the United States. Her great difficulty

arose from being pressed for payment at an inconvenient time. Her surplus productions on which she relied to meet her engagements had not only depreciated in value, but owing to the loss of banking facilities could not be brought to market. Under these circumstances it need not be wondered that the general business of the country was seriously interrupted. Three-fourths of the people of Upper Canada are engaged in agricultural pursuits, and the others are mainly dependent upon these. The fall in the price of wheat was clearly the great cause of our embarrassment. This article is the main element of the prosperity of Upper Canada. Its fall was not caused by the crisis, but was rather the cause of the crisis itself. England, through the full development of her manufacturing industry, is not so entirely dependent upon agriculture. The United States in their mines and manufactures have also sources of wealth apart from the products of the soil. Hence we see these countries speedily recover from the effects of the crisis. In Canada it is otherwise. The causes of our difficulties remain. Debts contracted in June, 1857, required double the quantity of produce to discharge them in June, 1858. The evil is incurred by our purchases being principally from abroad. The large importations send the gold out of the country and contract the Bank circulation. The scarcity of money prostrates internal trade, and the farmer's home market is destroyed. His returns are diminished on every side, while his liabilities remain the same. The purchase of an extra hundred acres of land, which under ordinary circumstances he could have easily met, becomes a source of embarrassment, and he is regarded as a speculator in real estate. The mechanic who in the bright day of prosperity had purchased a village lot, is thrown out of employment: he cannot meet his instalments and the savings of years fall into the hands of the sheriff. The suspension of home industry necessitates large importations of foreign goods, and the evil is increased. To show the disastrous results to Canada arising from the fall in the price of wheat and other causes; we have only to state the total exports from Canada for the last three years:

EXPORTS.

	1855.	1856.	1857.
Products of Agriculture.............	£3,656,396	4,384,082	2,747,516
" the Forest..............	1,986,980	2,504,970	2,982,516
Other Products.....................	587,486	562,979	682,492

It thus appears that the value of our exports of agricultural products fell nearly one-half between 1856 and 1857."

Following out the ideas thus indicated, the writer next analyses our Canadian imports, and shows by carefully prepared tables, that we have paid away, in 1857, £649,370 for imports, of which, considerably more than one-half, viz., £339,823, was paid for the items termed "*Animals*" and "*Meats*," while the remainder is chiefly taken up by such items as *Cheese*, *Butter*, *Poultry*, *Eggs*, *Lard*, and *Tallow*. For unmanufactured tobacco we payed last year £30,033; and for "vegetables" £16,477; and what seems still stranger, for *firewood* —which we should have fancied we were more likely to export than

import,—£16,054. In an agricultural country, chiefly dependent for its prosperity on the labors of the farmer, such statistics seem to point to unexplored avenues of economy and ultimate wealth; and to these as well as other useful facts accumulated in the highly practical pages of the *Canadian Almanac* we invite the attention of Canadian readers. The impolicy of Canada placing its whole dependence on the products of agriculture is justly dwelt upon; but also, remembering how essentially Western Canada is an agricultural country,—may we not still more press the force of the statistics above referred to, and deduce therefrom the impolicy of the Canadian farmer neglecting stock, cheese, and butter; and the Canadian agriculturist leaving the market gardens of the neighbouring States to supply our markets with pot-herbs to the value of £16,477, and our gardens and grounds with plants and shrubs, stated among the imports of 1857 at £12,787. So that, while real estate has been acquiring an extravagant, fictitious value, on the faith of the permanent maintenance of the price of a grain, which the experience of a very few years suffices to show is exposed to greater risks, and to wider fluctuations in market value than almost any other commodity: our American neighbours have been driving a profitable trade in supplying us with the common necessaries of life. It, no doubt, requires some laborious industry to compete for the sum of £48,041, thus annually slipping into the pockets of our shrewd and industrious neighbours over the line, for the two simple articles of butter and cheese; but it can be little else than sheer indolence and folly in our farmers to allow £6,675 to slip annually through their fingers for poultry and eggs imported from the States.

One other annual department of our *Canadian Almanac* always interests us, and that is the section devoted to Canadian Patents. Curious it is, in an inland, and so strictly agricultural Province, to find such an annual expenditure of mechanical ingenuity, in the majority of cases, we fear, with no great practical results. It proves, however, the presence amongst us of elements which we may yet confidently hope to see turned to good account in developing the manufacturing resources of the country. We have here no less than four new solutions of the problem of a perfect steamboat paddle; also "a self-loading cart;" "an improved spark arrester, chimney, and peticoat pipe for locomotives;" and other patented inventions of

the most varied kind, winding up with, "a head protector against heat, *coup de soleil*, &c."

It is not necessary that we should commend the *Canadian Almanac* to our readers, but we may say of it that in this twelfth appearance there is no diminution of the care, industry, and experience, which have secured for it its good credit in former years.

D. W.

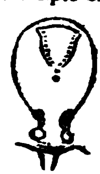
SCIENTIFIC AND LITERARY NOTES.

GEOLOGY AND MINERALOGY.

TRINUCLEUS CONCENTRICUS.

(T. Caractaci, Murch.; T. Goldfussi, Barr.)

The accompanying figure represents the glabella (enlarged) of an example of *Trinucleus concentricus*, obtained from the Trenton Limestone, in the neighbourhood of the Montmorenci Falls, near Quebec. It is deprived of its crust. In the elevated centre, two prominent tubercles occur, one a little in advance of the other in the direction of the axis. From the foremost of these run two series of very minute tubercles towards the anterior margin of the glabella, followed, on the outside, by a faintly-raised line. The latter, as shown in the figure, is continuous along the front edge of the glabella. Finally, at the contracted base of the glabella, two large tubercles are situated—one on each side, with a semi-circular depression just in front of them.



In the figures of this species given by Professor Hall in his Palæontology of the State of New-York, there are no indications of the peculiar tubercles occurring on the glabella of the present specimen; nor are they noticed by Sir Roderick Murchison, in his original figures and description of *T. Caractaci* (= *T. Concentricus*) in the "Silurian system." They occur, however, more or less distinctly, on all the Canadian specimens that have come under our observation. Barrande, in his great work on the Silurian Basin of Bohemia, describes the basal tubercles and depressions (mentioned above) in his *Trinucleus Goldfussi*, a species evidently identical with *T. Concentricus*. Barrande figures also the two central tubercles as occurring, according to his observations, in certain examples of *T. Goldfussi*; but he does not appear to have remarked the series of smaller tubercles as shewn in our figure. He looks upon the central tubercles as mere ornaments, disappearing with age, and hence of no importance as specific characters. As, however, the supposed "eye-tubercles" present on the cheeks of some species of Trinucleus, also appear to be obliterated by age, we cannot look upon these glabella-tubercles as wholly unim-

portant—so far, at least, as regards our knowledge of the organization-characters of these extinct types. For this reason, we have ventured to allude to them in the present note.

GEOLOGY OF GASPÉ.

We cull the following extracts from a very interesting paper by Professor Dawson, of McGill College, Montreal. It is published in the October number of the *Canadian Naturalist*, and entitled, "A Week in Gaspé:"

"The peninsula of Gaspé, the land's-end of Canada toward the east, presents within itself an epitome of several of the leading geological formations of the Province; and, here as elsewhere, these impress with their own characters the surface and its capabilities. On that side which fronts the river St. Lawrence, it consists of an enormous thickness of shales and limestones, belonging to the upper part of the lower silurian series, and the lower part of the upper silurian. These beds, tilted in such a manner that they present their up-turned edges to the sea, and dip inland, form long ranges of beetling cliffs running down to a narrow strip of beach, and affording no resting-place even for the fishermen, except where they have been cut down by streams, and present little coves and bays opening back into deep glens affording a view of great rolling wooded ridges that stand rank after rank behind the steep sea-cliff, though, no doubt, with many fine valleys between...... Resting on the Upper Silurian beds that form Cape Gaspé, and, of course, newer in geological time, is a series of grey, red, and brown sandstones and shales. These rocks belong to the Devonian system, the equivalent of the older part of the Old Red Sandstone of Scotland, and probably of the Hamilton and Upper Helderburg groups of New-York. Doubled into a trough along the south side of Cape Gaspé, they form a low country in which Gaspé Bay stretches far inland, affording a noble harbour for shipping...... Southward of Gaspé Bay, the Devonian rocks are capped by a great mass of conglomerate, belonging to the Lower Carboniferous series, and made up of pebbles of all the rocks from the old Laurentian of the North Shore, to the Devonian. It is this bed which gives its picturesque character to the scenery of Percé, and which running onward with a slight dip to the southward, underlies the coal-formation of New-Brunswick."

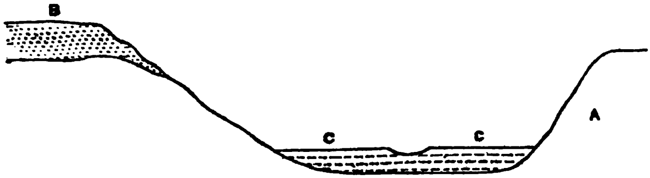
The following observations, from the same paper, are also of much interest in their geological bearings. After some remarks on the different species of whales taken in the Gulf of the St. Lawrence, Professor Dawson continues: "On the long sand point that, stretching far into the bay, shelters the harbour, I observed an appearance new to me, and of some geological interest. Shoals of the American Sand Launce (*Ammodytes Americanus*) a little fish three or four inches in length had entered the Bay, and either seeking a place for spawning or sheltering themselves from their numerous enemies, had run into the shallow water near the point, and, according to their usual habit, had in part buried themselves in the sand which they had thrown up by means of their long pectoral fins. In this situation, countless multitudes had died or been thrown on shore by the surf, and the crows were fattening on them, and the fishermen collecting them in barrels for bait. Acres of them still remained whitening the bottom of the shallow water with their bodies. It was impossible not to be reminded by such a spectacle of the beds

full of capelin in the post-pliocene clay of the Ottawa, and the similar beds filled with fossil fishes in other deposits as far back as the old red sandstone. Geologists have often sought to account for such phenomena, by supposing sudden changes of level, or irruptions of poisonous matter into the waters; but such catastrophes are evidently by no means necessary to produce the effect. Here in the quiet waters of Gaspé Bay, year by year immense quantities of the remains of the Sand Launce may be imbedded in the sand and mud without even a storm to destroy them. Similar accidents, I was told, happen to the shoals of capelin, so that there is nothing to prevent the accumulation here of beds, equally rich in the remains of fishes with these other deposits of ichthyolites that have excited so much interest and wonder."

ALLEGED DISCOVERY OF A FOSSIL CONUS IN THE DRIFT OF WESTERN CANADA.

One of our students, Mr. James Mitchell, of the Village of York on the Grand River, has placed in our hands a small and water-worn specimen of a cone, said to have been obtained from a gravel pit in that locality. Fearing some mistake, we paid a visit to the spot; and although we failed to procure another specimen, we obtained indirect evidence of the occurrence of this or a similar shell in the gravel pit in question. On asking a laborer engaged there, if he ever met with shells of any kind in the gravel, he replied: "Yes, sometimes; little kind o' shells like big at one end and pointed at the other!"—a homely, but perfectly intelligible description of a low-spired cone. The gravel deposit forms the capping of a high hill or portion of a ridge overlooking the valley of the Grand River. It contains rolled boulders of gneiss, limestone, &c., and is evidently a true drift accumulation, although (like many of our drift deposits) it is more or less coarsely stratified. The underlying rock of the country, is a greyish limestone, apparently poor in fossils, belonging to the Gypsiferous or Onondaga group. Large irregular masses of gypsum occur in it, in the immediate neighbourhood. The broad "flats" along the borders of the Grand River, belong to a period more recent than that of the true drift. They contain an immense number of specimens of *helix* (two species) *bulimus* (two species), *melania*, *limnea*, *planorbis*, *cyclas*, and perhaps other terrestrial and fresh-water genera. The occurrence of a species of *conus* in the drift, can scarcely be accounted for except on the supposition that a patch of Eocene or other Tertiary deposits existed during the Drift period, at no great distance from the spot in question. From these deposits (now entirely washed away) the fossil cones, with perhaps a portion of the accompanying drift materials, may then have been derived—the solid structure of the cone shells preventing their destruction. The crystalline boulders in this gravel are for the most part of small size, whilst all the larger stones belong to the rocks of the surrounding country. Amongst other, we collected a piece of brown ferruginous sandstone, with modiolopsis and tellinomya impressions, belonging to the Clinton group, of which there is an outcrop about fifteen miles to the north of the locality under consideration. But whatever may be the true explanation of this apparently paradoxical case, we have thought it advisable to call attention in the present notice to the alleged occurrence of these shells in our western drift, in the hope that further explorations, to substantiate the fact, may be set on foot by persons residing in the neighborhood. The accompany-

ing sketch-section shews the position of the gravel-pit on the left bank of the Grand River, and its relations to the other deposits of the locality:



A is the (Upper Silurian) Gypsiferous Limestone rock of the district; B the drift gravel; and C the fresh-water deposits of the Grand River Flats. These latter deposits, as already stated, belong to a more recent period than that of the true Drift.

AUGITE AND HORNBLENDE.

Rammelsberg has published a very valuable paper on the relations of Augite and Hornblende, including the various species of these respective types. His analyses shew that the oxygen ratio in the Hornblende type, instead of being as 4 : 9, is actually, *as in the Augite type*, as 1 : 2—giving for each, the common formula 3 R O, 2 Si O^3. In the aluminous hornblendes, he places the alumina with the silica; or, in other words, makes the two vicarious, as suggested by Bonsdorff many years ago. When $Fe^2 O^3$ is present, as in acmite, &c., it is shewn to act the part of a base, and thus to replace the oxides R O. [There can be little doubt that acmite is to a certain extent an altered mineral; and, very probably, the $Fe^2 O^3$ in these minerals, existed originally, in all cases, as Fe O.]*

WITHERITE (CARBONATE OF BARYTA).

Our attention has been recently attracted to a peculiarity, not hitherto noticed in mineralogical works, in the blowpipe reactions of certain specimens of Witherite (B a O, C O^2) from one of the Cumberland localities. These specimens (of a yellowish-white colour) became, after strong heating, pale greenish-blue. This arises from the presence of a very small amount of oxide of manganese. A coloration of this kind from the presence of manganese, can only occur—apart from the alkaline carbonates—with carbonate of baryta. A blowpipe test by the author of this note, founded on a similar reaction, is given in the fourth edition of Plattner's *Probirkunst mit dem Lothrohre*, p. 186. It is well known that if a manganese compound be fused with carbonate of soda, an opaque greenish-blue glass or so-called "turquoise enamel" will result. The fused bead is green whilst hot, and becomes blue on cooling. If to a bead thus coloured, baryta be added, and the whole be

* The author is guilty of a somewhat remarkable oversight, when he states, in reference to the crystallization of Wollastonite, that, "die selten deutlichen Krystalle dieses Minerals, welche Brooke, Phillips, und von Kobell beschrieben haben, lassen zum Theil keine ungezwungene Vergleichung zu, und man hat bisher nicht gut vermocht, ihre Form auf die des Augits zurückzuführen"—because, if the reader will refer to Dana's system of Mineralogy, (4th ed., vol. 2, page 157,) he will find the crystal-relations of Wollastonite to Augite most clearly pointed out; and exactly in the same manner, moreover, as now shewn by Rammelsberg. E. J. C.

fused together, no change of colour will ensue; whereas with strontia, &c., the colour is changed to dull grey or brown. And, in like manner, if a baryta salt in powder be simply heated with a drop of a manganese solution, the mass will be coloured blueish-green: the colour in this case, as in the cases mentioned above, arising from the formation of manganate of baryta.

Book received:—"Figures and Descriptions of Canadian Organic Remains. Decade III." This important publication, issued by the Geological Survey of Canada, will be noticed in full, in the next number of our Journal.

E. J. C.

NATURAL HISTORY.

AGE OF TREES.

The following extract from the *Gardener's Chronicle*, edited by Dr. Lindley, is of considerable interest. If those who cut down large trees in Canada would note the number of rings, with the diameter, or circumference, and the kind of tree, we should soon possess valuable data for judging of the rate of growth of our trees, such as in a little time could not fail to be found practically useful.

"Is it possible to judge of the age of an old tree by its circumference? we do not mean precisely, but with any approach to exactness. Can we, for instance, ascertain the age of a very ancient oak within a century of the truth? This is a point which seems to us worth investigation. That a tolerably exact inference may be drawn from counting the rings of wood, even such as remain when a tree has become hollow, is well known. But questions constantly arise with reference to standing trees, whose wood-rings of course cannot be examined, and it is to them that we would direct enquiry.

The only way of arriving at a certain conclusion is evidently to determine the average rate of growth of trees of various kinds. Could we, for example, find the average of successive half centuries of growth, extending over any long period of time, the method of computation would be obvious. But it is precisely this which, as far as we know, remains in need of demonstration. Books, indeed, contain scarcely anything tangible on the subject. One writer estimates the age of an oak tree, 47 feet in circumference, to be not less than 1500 years; another (Marsham, writing of the Bentley Oak) gives the same age to a tree only 34 feet round; sufficient proof that no real guide to age was known to those writers. The late Prof. Zuccarini endeavoured to work out this problem (see *Lindley's Intr. to Botany*, 1, 204), but without success; for he found such enormous differences between the rate of growth of specimens of the same species of tree (Yews and Scotch Firs, the subject of his examination), as to be driven to the conclusion that the age and number of rings of a tree cannot be determined with any probability from the diameter, except when trees have grown under exactly similar

conditions. But what constitutes exactly similar conditions in an enquiry like this? Exactitude, literally speaking, can never enter into such enquiries. No two trees ever existed under circumstances exactly similar. All that can be required is that conditions shall be tolerably similar, which was far from being the case with Zuccarini's specimens of Yews, obtained, as he tells us, from situations on the Bavarian Alps differing by 3000 feet of elevation above the sea.

Sufficiently similar conditions would, we think, in a case like this, be found in the comparison of old English Oaks with one another, and on that point we would for the present fix attention. Is there any tolerable uniformity of growth among English Oaks which remain to acquire anything like antiquity? in other words, among vigorous oaks, for all others would be felled in the ordinary operations of the forester. Perhaps that point is not altogether beyond the reach of inquiry, for many opportunities must occur of measuring the diameter and counting the rings of old oaks when felled; and there must also be many standing oaks of some considerable size, the age of which is ascertainable without felling. A collection of such data might be formed from which averages applicable to the inquiry before us might be easily drawn. Unfortunately they can hardly be said to exist at present; but some are on record, from which, by way of illustration, we have formed the following table. This evidence seems to show that on an average vigorous oaks grow at something like the following rate in England:—

In the	1st	50 years	they reach	12	inches	in diameter	[50]
"	2nd	"	"	19	"	"	[100]
"	3rd	"	"	26	"	"	[150]
"	4th	"	"	32	"	"	[200]
"	5th	"	"	36	"	"	[250]
"	6th	"	"	40	"	"	[300]

That is to say, a vigorous English oak will, on an average, be rather more than 26 inches in diameter when 150 years old, and 40 inches in diameter when 300 years old. In this computation it is assumed that after 100 years the rate of growth is reduced to seven inches for the next 50 years, to six inches for the succeeding 50 years, and then falls permanently to an increase of four inches in diameter for every half century.

We find that this mode of reckoning brings the age of the Berkley Oak, 34 feet in circumference, exactly to 1500 years, the period assigned to it by Marsham, and would carry the oak, 47 feet in circumference, mentioned by South, to 2150 years. In like manner the great Winfarthing Oak, said to have been called "The Old Oak" at the Conquest, and which in 1820 was about 14 feet in diameter, must have been at that time 1900 years.

We have been led into these calculations from a wish to ascertain the age of some superb old Spanish Chesnut trees growing on a terrace overlooking the valley of Sir William Middleton's most beautiful seat at Shrubland Park, near Ipswich. These trees vary in size, but all are venerable objects, twisted like colossal cables, and exemplifying on a gigantic scale the universal fact that the fibrous grain of trees is spiral. Of these one is 44 feet round at the ground, and 27 feet round at six feet higher up. If the foregoing scale of growth for the Oak is true, and if, as

is believed, the Spanish Chesnut grows twice as fast as the oak, then the age of this monument of ancient times must be 575 years. In another place, far away in the park, is a still vigorous gigantic tree, 19 feet in circumference, to which the age of 375 years would have to be assigned.

Now what we want to know, and what we submit to the consideration of our readers, is how far our calculations are supported by reliable facts. Is it true that the oak grows at the rate assumed? Is it true that Spanish Chesnuts grow twice as fast? If not, what is their real rate of growth? and upon what evidence is that their supposed real rate founded? This seems a subject deserving the consideration of some of our experienced foresters."

MILDEW.

"We understand that there is great probability of an effectual remedy for mildew and red spider having been discovered, wholly free from the objections attaching to sulphur either in powder or in a volatile state. How valuable that agent is we all know; but it is troublesome to apply, uncertain in its action, and, if mismanaged, more mischievous than the evils it counteracts. As for example when it is fired, the effect of which is to charge the atmosphere with fumes of sulphurous acid, one of the most fatal to vegetation of all known substances.

At present our information amounts only to this: that Mr. Wilson, the very able and scientific manager of Price's Candle Company, has prepared a soap, which, being dissolved in water and applied with a syringe, does effectually and without the least risk all that flowers of sulphur can do. It is said that one of the principal nurserymen near London has been trying the soapy water, of different strengths, and is very favorably impressed with its efficacy. Six ounces of the soap in a gallon of water killed mildew for the time and continued to keep it down when applied weekly. Pot Roses, after three applications, became nearly clean, and were in fact saved; their soft young points indeed were killed, but that was of no importance; the rust of Moss-roses disappeared before its action. In other hands red spider was effectually kept down; one lb. of the soap dissolved in four gallons of water, completely cleaned even Peach trees after two or three applications, the trees having been well syringed a day or two afterwards.

The name of this new soap or substance is, we are informed, "The Gerhurst Compound," and if it is found in other hands to preserve the good qualities ascribed to it, Mr. Wilson will certainly have conferred one of the greatest possible benefits upon horticulture. A trial is about to be made of it in the garden of the Horticultural Society, at Bowood, Trentham, Chiswick House, and several other large establishments."

CHEMISTRY.

Synthesis of the Hydrocarbons.—The ingenious Berthelot, has published *in extenso* his experiments on the preparation of organic compounds from inorganic materials, a process of which, chemists possessed but few examples previous to his discoveries. The hydrocarbons which he has obtained, are marsh gas, ole-

fiant gas, propylene, butylene, amylene, benzine, and napthaline, and in order to remove any objection that might be raised to the employment in his experiments of carbon derived from animals or vegetables, and which might therefore be supposed to retain to a certain extent its organic structure, he prepared the carbonic oxide, which forms the starting point in his investigations, from carbonate of baryta and iron.

Water being made to act upon this gaseous oxide of carbon, at a temperature of 100° C, and in presence of potassa, formate of potassa was produced. From this formic acid and formate of baryta were prepared. By the action of heat, this salt was decomposed, and furnished among other products, marsh gas, C^2H^4, olefiant gas C^4H^4, and propylene C^6H^6.

The olefiant gas was combined with sulphuric acid, and from this sulphovinic acid, and by decomposition, alcohol were formed. From the alcohol, all the compounds of the Ethyle series could be obtained.

Marsh and olefiant gas may also be produced from bisulphide of carbon.

Butylene may be formed by the distillation of acetate of soda, the acetic acid produced by the oxidation of the alcohol generated in the manner described.

Napthaline has been formed by means of sulphide of carbon, and benzine by alcohol and acetic acid. Methylic alcohol can be produced from marsh gas C^2H^4, by replacing one equivalent of hydrogen by chlorine, whereby chloride of methyle is obtained C^2H^3, Cl, which by decomposition yields the alcohol.

Propylic alcohol from the sulphuric compound of propylene obtained as above.

From the hydrocarbons the hydracid ethers can be obtained by direct union, (? under pressure) and from these the alcohols.

Sulphate of Baryta.—Kuhlmann has succeeded in decomposing this native salt by acting on it with charcoal and the residue from the preparation of chlorine, viz: crude chloride of manganese.

From the chloride of barium so obtained, he prepares the artificial sulphate by precipitation, and this kept in a moist state possesses all the properties of white lead, and is not so objectionable, being unalterable by ordinary re-agents.

(The sulphate of baryta occurs in Canada in considerable quantities and apparently in a very pure state, associated with galena. H. C.)

Formation of Sugar.—As is well known, cellulose the most important constituent of vegetables is readily converted into sugar. The principle contained in the organic part of the skeleton of the invertebrata differs materially from that contained in the vertebrata, and has the same composition as cellulose. Although this substance strongly resists the action of the most powerful chemical re-agents, Berthelot has succeeded in producing sugar or glucose from it, similar to that produced from cellulose.

He operated upon the substance which he called tunicine, obtained from the envelopes of an ascidia, and also upon chitine prepared from the shell of the Spiny Lobster.

These results form a new and intimate bond, founded on a definite chemical transformation, between the immediate principles contained in the envelopes of the invertebrata, and those which form the tissues of vegetables. H. C.

THE ANNUAL YIELD OF NITROGEN PER ACRE IN DIFFERENT CROPS.

Those elaborate agricultural experimenters, scientific and practical, J. B. Lawes, F.R.S., and J. H. Gilbert, Ph. D., F.C.S., read, at the meeting of the British Association for the Advancement of Science, recently held in Leeds, an interesting and somewhat original paper on the above subject, of which the following is a very brief abstract. The extensive, accurate and costly investigations which the writers have been in the habit of pursuing for a number of years, on Mr. Lawes' estate at Rothamsted, in Hertfordshire, give great weight to the conclusions at which they may arrive, in reference to scientific and practical agriculture.

The assimilation of free nitrogen by plants, the authors had determined by carefully conducted experiments made in the field. The amount of nitrogen yielded per acre per annum, in different crops,—even when unmanured,—was considerably beyond that annually coming down in the forms of ammonia and nitric acid, in the yet measured and analysed aqueous deposits from the atmosphere. The annual produce of nitrogen per acre had been determined from various crops, grown consecutively for several years on the same land,—such as, wheat, fourteen years; barley, six years; meadow hay, three years; clover, three years out of four; beans, eleven years; and turnips, eight years. In most of these instances the yield of nitrogen had been estimated, both for the crop grown without manure of any kind, and for that with purely mineral manure, having no artificial supply of nitrogen.

Beans and clover were found to yield several times as much nitrogen per acre as wheat or barley, yet their crops were an excellent preparation for wheat. A year's *fallow*, and *adding nitrogenous manure*, had each been found similarly to increase the produce of the cereal crops. Other results obtained illustrated the fact, that four years of wheat, alternating with *fallow*, gave as much nitrogen in eight years as eight crops of wheat grown consecutively. Again, four crops of wheat, grown in alternation with *beans*, yielded nearly the same amount of nitrogen per acre as the four crops grown in alternation with fallow; consequently, also, much about the same as the eight crops of wheat grown consecutively. In the case of the alternation with *beans*, therefore, the whole of the nitrogen obtained in the beans themselves was over and above that which was obtained during the same series of years in wheat alone, whether it was grown consecutively or in alternation with fallow.

Interesting questions arose, therefore, as to the varying sources or powers of accumulation of nitrogen in crops so dissimilar. Leguminous crops, yielding a large amount of nitrogen, were found in practice to be not materially benefitted by the application of nitrogenous manures; while the cereals affording a comparatively small quantity of nitrogen, are found much benefitted by such manures. It was found that over a series of years only about four-tenths of the nitrogen annually supplied in manure for wheat or barley was recovered in the immediate crop. It was an interesting and, as yet, in part unsolved question, what became of this unrecovered amount of nitrogen. Has it been drained away and lost? or did a portion remain in a fixed and unavailable state of combination in the soil? Further elucidation is necessary before such enquiries, connected with agricultural theory and practice, can be satisfactorily explained. Chemistry has yet much light to throw upon these anomalous and difficult matters. G. B.

SALT AS A MANURE.

Some thirty years ago, Parkes, the author of the well known *Chemical Catechism*, published a pamphlet setting forth the extraordinary properties of common salt (chloride of sodium) as an agricultural fertilizer. At that time a heavy excise duty was imposed upon the article in England, so that only the merest refuse could be used for the purpose of manure. Subsequently, as the tax became diminished and at last totally repealed, salt was extensively tried in various parts of the British Islands, either by itself or in conjunction with farm-yard dung, as a dressing for several kinds of crops. The results, however, at that time do not appear to have been very encouraging, since the practice rapidly declined. Notwithstanding, the application of salt to manure heaps, and to hay and straw as fodder for cattle, has more or less extensively obtained in the best managed districts, particularly since the repeal of the duty; and we find, from more recent British agricultural periodicals, that the article is again claiming the serious attention of practical farmers.

A correspondent in a recent number of the *Agricultural Review and Journal of Rural Economy*, published in Dublin, details the results of his trials of the application of salt to different kinds of crops. Four Irish acres were prepared and sown with Swedish turnips, manured with thirty-five tons of farm-yard dung per acre. To one half of the field ten cwt. of salt was applied to the acre. In August mildew was found seriously affecting the turnips on the portion not salted, but where that article had been applied the disease was hardly perceptible, and the plants continued to grow vigorously to the end. It was found by weighing that the ultimate produce was seven tons per acre over the unsalted.

It has been commonly supposed that as the atmosphere of the British Islands must be largely impregnated with saline matter from the surrounding seas, the artificial application of salt to the cultivated crops was superfluous and attended with comparatively trifling benefit. Recent trials, however, carefully conducted, seem to strengthen an opposite conclusion. And from all we can learn of the effects produced by salt when applied as a manure, either to the cereals or root crops in Canada, there appears, upon the whole, substantial reasons in favor of its fertilizing and healthy influence upon vegetation in general. As a condiment, given directly to the domesticated animals of the farm, or sprinkled over hay and straw when gathered into the barn or rick, and intended for feeding purposes, its healthy influences are generally well known and appreciated on this continent.

G. B.

MAKING GRASS INTO HAY.

As a general rule, both grass and grain are allowed to stand too long before they are cut. The more nutrient portions of them,—starch and sugar,—by permitting the seed to become perfectly ripe before cutting, are in a great degree converted into woody fibre, a substance that is to animals comparatively innutritious. In the case of wheat, it has been demonstrated, by carefully repeated experiments and analyses, that the grain, as soon as it emerges from the milky state, and before the straw gets perfectly yellow, possesses the maximum amount of starch and gluten; in other words, has the largest amount of nourishing ingredients, and consequently the highest commercial value. In the process of perfect ripening, a portion of the nutrient qualities of the grain are changed into the

woody fibre, forming the cuticle or bran, which invariably becomes rough and thick as the grain approaches perfect ripeness.

It is the same with many of the grasses, which are generally allowed to become too ripe before they are cut for hay. With what are termed the artificial or cultivated grasses this is especially the case. These are the most nutritious when in blossom, before the seed has commenced being formed. As the seed begins to be developed, the stems and leaves become less adapted for feeding purposes to animals, owing to the production of woody fibre in the stem, and of nutrient compounds in the seed. From recent remarks, however, this does not appear to be the case with all species of grass,—such, for example as are designated "natural." It is noted in *Morton's Cyclopædia of Agriculture*, the best recent authority on these matters in the English language, that Cock's-foot grass (*Dactylis Glomerata*) is more valuable when ripe than at the time of flowering, in the proportion of seven to five; Meadow Fox-tail or Timothy (*Phleum Pratense*) in the ratio of fourteen to five; and that of Crested Dog-tail (*Cynosurus Cristatus*) yields twice as much grass when the seed is ripe as when coming into flower, but that a given weight of it is only half as nutritious as when coming into flower. Meadow Fescue (*Festuca Pratensis*), again, is more valuable at the time of flowering than when ripe, in the ratio of three to one; and the tall oat-like grass (*Holcus Arenaceus*) in the ratio of five to two. The seed of the sweet-scented Vernal grass (*Anthroxanthum Odoratum*), Meadow Fox-tail (*Alopecurus Pratensis*), and Sheep's Fescue (*Festuca Ovina*) should be completely ripe before they are mown; and the Smooth-stalked Meadow Grass (*Poa Pratensis*), Hard Fescue (*Festuca duriuscula*), and Quaking Grass (*Briza media*), may be most profitably cut and made into hay when in full blossom. In Canada, Timothy and Clover form almost the whole of our meadow grasses, and they may be most advantageously converted into hay as soon as their flowers are fully matured. In meadows containing several species of grass, the best rule is to mow as soon as the later kinds get into flower. In practice it may very safely be affirmed that, as a general thing, people cut their grass *too late*.

Hay-making may be said to be a somewhat delicate art, requiring the strictest attention to the varying conditions of the weather. In this country, too much exposure is a common fault, and hence our hay looses much of the delightful aroma so generally characteristic of newly made hay at home. The great object in hay-making is to retain as much as possible of the soluble, especially of the organic compounds contained in the grasses. A gradual evaporation of the water contained in the grass is preferable to a rapid process. If hay contain too much moisture when put into ricks, the consequence will be that it will heat and decompose; that is it will become worthless for food to animals. Most hay in this climate, saved in the ordinary way, contains from fifteen to twenty per cent., by weight, of water. It takes, upon an average, about four tons of green grass to give a ton of hay, and it accords with experience that a variable portion of the nutriment of grass is lost in its conversion into hay. It has been found, from careful experiments, that every 100 lbs. of grass contains 7 lbs. of matter soluble in hot water, and 2 lbs. of matter soluble in cold water; while the hay produced therefrom contains only 4 lbs. and 1½ lbs., the remainder having been dissipated in the conversion of the grass into hay. G. B.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST—AUGUST, 1858.

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 min. 33 sec. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Mean Temp. +or— of the Average	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resultant Direction.	Velocity of Wind.					Rain in Inches.	Snow in Inches.
	6 A.M.	2 P.M.	10 P.M.	MEAN.	6 A.M.	2 P.M.	10 P.M.	M'N		6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.		6 A.M.	2 P.M.	10 P.M.	Re-sul't.	ME'N		
					°	°	°	°	°												°							
1	29.595	29.599	—	—	62.4	75.1	—	—	—	.383	.466	—	—	.67	.54	—	—	N b W	S E	E b N	N 76 E	6.0	4.0	4.0	3.66	4.51	......	...
2	.579	.591	29.531	29.5795	65.7	71.5	68.9	69.60	+ 2.75	.490	.541	.555	.527	.77	.69	.78	.73	N E	E b N	E b S	N 53 E	7.5	14.5	10.0	10.98	11.17	1.010	...
3	.458	.345	.428	.4048	66.7	78.3	70.0	71.22	+ 4.37	.590	.650	.584	.603	.93	.67	.79	.80	E S E	S W b W	Calm.	S 26 W	12.8	18.5	0.0	4.94	7.75	0.330	...
4	.419	.402	.488	.4390	69.1	81.7	67.5	72.98	+ 6.18	.652	.498	.492	.546	.92	.46	.74	.70	S W b W	W b S	W	S 73 W	2.0	17.0	1.0	5.86	6.78	0.420	...
5	.555	.571	.607	.5825	68.9	81.4	66.6	73.47	+ 5.67	.500	.473	.465	.471	.76	.44	.71	.61	N W	W b N	N W b W	N 67 W	0.4	12.0	3.8	8.19	8.36	......	...
6	.633	.654	.683	.6620	66.1	82.1	68.9	73.75	+ 6.98	.443	.504	.396	.453	.65	.45	.56	.55	N W	N N W	N b W	N 26 W	11.8	15.5	7.2	10.51	10.76	......	...
7	.710	.729	.745	.7392	64.1	77.0	68.6	70.63	+ 3.97	.439	.590	.594	.543	.79	.63	.85	.73	Calm.	S b W	Calm.	S 9 W	0.0	3.0	0.0	1.17	1.38	......	...
8	.763	.745	—	—	62.2	77.8	—	—	—	.607	.640	—	—	.88	.67	—	—	Calm.	E S E	Calm.	S 64 E	0.0	2.0	0.0	1.32	1.51	......	...
9	.703	.639	.640	.6582	69.3	82.1	73.4	75.72	+ 9.17	.515	.702	.631	.631	.72	.64	.77	.71	Calm.	S S E	N	S 82 E	0.0	4.0	5.7	1.52	3.14	......	...
10	.642	.596	.556	.5903	68.0	81.6	78.0	77.07	+10.55	.581	.696	.678	.657	.85	.64	.70	.71	N	S	S	S 5 E	1.8	6.8	4.5	0.49	3.97	......	...
11	.547	.551	.620	.5770	66.7	78.1	71.1	72.18	+ 5.75	.543	.637	.639	.612	.83	.68	.84	.78	Calm.	N W b W	N	N 24 W	0.0	8.5	7.2	4.90	5.22	Inap	...
12	.719	.807	.873	.7993	69.0	77.2	68.6	72.20	+ 5.87	.572	.587	.497	.550	.82	.63	.71	.69	N b W	S E b S	N N E	N 74 E	10.0	8.8	3.5	2.69	5.39	......	...
13	.931	.933	.899	.9192	67.3	74.2	68.0	69.93	+ 3.72	.350	.532	.567	.493	.58	.63	.82	.67	N b E	E b S	S E b S	N 78 E	7.0	8.0	0.4	4.62	5.25	......	...
14	.859	.772	.639	.7463	64.6	79.8	72.5	73.00	+ 6.77	.511	.537	.577	.565	.83	.53	.73	.70	N E b E	S b E	E S E	S 88 E	3.2	5.0	1.5	2.56	3.92	......	...
15	.578	.538	—	—	64.2	80.3	—	—	—	.472	.547	—	—	.78	.52	—	—	Calm.	W N W	N W b N	N 52 W	0.0	5.2	5.0	4.46	6.85	Inap	...
16	.737	.752	.766	.7555	63.1	74.3	65.7	68.38	+ 2.35	.421	.597	.490	.509	.72	.70	.77	.73	N b W	S E b E	Calm.	S 75 E	1.0	4.0	0.0	1.82	1.99	......	...
17	.740	.618	.549	.6375	64.6	79.4	72.9	73.05	+ 7.08	.499	.558	.616	.564	.81	.55	.76	.70	Calm.	S S E	S b W	S 11 E	0.0	9.2	2.5	4.72	5.36	......	...
18	.447	.384	.565	.4762	66.8	69.6	57.4	65.47	— 0.37	.535	.602	.301	.459	.82	.83	.63	.71	W	N W	N N W	N 47 W	1.4	16.0	11.0	7.49	10.51	0.205	...
19	.625	.602	.523	.5782	53.7	61.0	51.5	56.60	— 9.17	.285	.254	.318	.283	.69	.47	.75	.62	N b E	N W	N W b N	N 25 W	1.5	8.5	3.0	4.15	4.28	......	...
20	.509	.416	.543	.4997	52.8	73.3	63.9	65.15	— 0.40	.319	.416	.318	.344	.79	.50	.54	.57	Calm.	W b S	W b N	S 80 W	0.0	19.0	4.5	7.84	8.65	......	...
21	.646	.618	.625	.6300	58.7	75.4	66.9	66.32	+ 0.88	.348	.310	.335	.335	.81	.34	.50	.54	W b N	W b N	N W b N	N 63 W	3.5	12.6	9.8	8.97	9.30	Inap	...
22	.653	.689	—	—	56.8	65.3	—	—	—	.306	.241	—	—	.73	.38	—	—	W b N	N W b N	N W b W	N 42 W	3.8	24.0	10.5	14.95	15.40	......	...
23	.870	.847	.807	.8347	48.9	63.5	56.3	55.90	— 9.28	.257	.176	.238	.251	.74	.29	.64	.58	N W b N	N W b W	W N W	N 54 W	10.8	12.1	4.0	5.86	7.83	......	...
24	.828	.736	.809	.7878	45.4	73.3	56.3	60.32	— 4.63	.215	.242	.332	.275	.70	.28	.73	.56	W N W	W	Calm.	N 84 W	3.2	11.2	0.0	6.06	6.47	......	...
25	.891	.856	.883	.8793	51.6	70.4	59.7	61.47	— 3.27	.293	.393	.400	.356	.77	.53	.78	.66	N N W	S S E	S E b S	S 50 E	1.4	9.5	2.8	2.28	5.49	......	...
26	.823	.693	.551	.6725	57.2	69.3	64.2	64.03	— 0.50	.404	.495	.530	.481	.86	.69	.89	.81	N b E	E b S	E b N	S 57 E	5.0	6.2	5.8	6.14	7.60	0.535	...
27	.333	.353	.389	.3635	63.7	72.5	65.1	67.93	+ 3.62	.510	.564	.565	.545	.80	.71	.91	.80	S b E	S b W	S b W	S 8 W	23.2	14.2	4.0	7.93	9.75	......	...
28	.363	.276	.263	.2907	61.7	66.7	57.7	61.50	— 2.63	.433	.598	.415	.487	.79	.91	.93	.89	N N W	N N E	W b S	N 60 W	7.2	2.5	5.5	3.69	8.32	1.015	...
29	.244	.300	—	—	56.8	57.5	—	—	—	.409	.429	—	—	.88	.91	—	—	S W b S	S W b S	S W b S	S 30 W	8.5	8.5	9.0	7.16	7.18	.270	...
30	.312	.309	.479	.4157	55.1	62.6	59.3	60.02	— 3.69	.439	.515	.435	.467	.91	.90	.86	.90	Calm.	S	N W	N 70 W	0.0	4.5	5.6	2.44	4.08	.105	...
31	.536	.568	.622	.5857	58.8	66.7	57.7	61.07	— 2.25	.441	.440	.389	.412	.89	.66	.81	.76	N W	S b W	N N W	S 55 W	3.2	8.8	2.4	2.03	3.90	......	...
M	29.6325	29.6077	29.6199	29.6194	61.62	73.97	65.37	67.61	+ 1.85	.446	.505	.478	.478	.79	.59	.75	.70	......	......	......	N 69 W	4.35	9.76	4.33	......	6.50	3.890	...

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR SEPTEMBER.

Highest Barometer........................ 30.098 at 10 p. m., on 26th } Monthly range=
Lowest Barometer .... 29.167 at 2 p. m., on 16th } 0.931

Self-registering Thermom.
- Maximum Temperature............ 81°.4 on p. m. of 9th } Monthly range=
- Minimum Temperature............ 35°.6 on a. m., of 23rd } 45°.8
- Mean maximum Temperature .... 67°52 } Mean daily range=
- Mean minimum Temperature .... 50°79 } 16°.73
- Greatest daily range .... 29°.0 from a. m. to p. m. of 20th.
- Least daily range.................. 9°.4 from a. m. to p. m. of 16th.

Warmest day......... 9th ... Mean temperature......... 70.98 } Difference = 24°66.
Coldest day.......... 22nd ... Mean temperature......... 46°32 }

Maximum Radiation. { Solar.................................. 101° 4 on p. m. of 9th } Monthly range=
{ Terrestrial............................ 24°.2 on a. m. of 23rd } 77°2.

Aurora observed on 8 nights, viz., on 1st, 7th, 8th, 10th, 12th, 13th, 20th, and 22nd.
Possible to see Aurora on 23 nights; impossible on 7 nights.

Snowing on —— days,—depth —— inches; duration of fall —— hours.

Raining on 8 days,—depth 0.735 inches; duration of fall 21.9 hours.

Mean of cloudiness = 0.41.

Most cloudy hour observed, 2 p. m., mean = 0.50; least cloudy hour observed 10 p. m., mean, = 0.30.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
1147.03	1448.27	721.12	1780.97

Resultant direction S. 74° W.; Resultant Velocity 1.53 miles per hour.
Mean velocity............................ 5.69 miles per hour.
Maximum velocity .... 24.8 miles from noon to 1 p. m. on 16th.
Most windy day......................... 16th...Mean velocity 13.42 miles per hour.
Least windy day .... 28th...Mean velocity 1.62 ditto.
Most windy hour ... 2 to 3 p.m..............Mean velocity 10 32 ditto. } Difference
Least windy hour...midnight to 1 a. m. ...Mean velocity 2.13 ditto. } 8.19 miles.

Thunderstorms occurred on 30th from 1 to 3 p. m.

Sheet Lightning recorded on 3rd at 10 p. m.; 5th, at 8 p. m.; 8th, 7 p. m. to midnight; 11th, 7 to 10 p. m.; and 15th, from 7 to 8 p. m.

Corona round the moon on 22nd at 10 p. m.

Heavy Dew recorded on 13 mornings during the month.

First Frost of the season on 18th, at 5.30 a. m., and noted also on the 23rd, 25th, and 26th.

Dense Fog on the 2nd at 5 to 8 a. m.; and on 28th, 7 to 9 p. m.

Brilliant Meteor observed in the W. at 9.15 p. m. on the 27th.

The Resultant Direction and Velocity of the Wind for the month of September, from 1848 to 1858, inclusive, were, respectively, N. 61° W. and 0.94 miles.

The month of September, 1858, was warm, clear, and dry—the depth of rain which fell being less than one-fifth of the average of the last 18 years.

COMPARATIVE TABLE FOR SEPTEMBER.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	M'n.	Dif. from Aver	Max. ob'd.	Min. ob'd.	Range.	No. of days.	Inch's.	No. of days.	Inch's.	Resultant Direction.	Resultant V'y.	Mean Force or Velocity.
	°	°	°	°	°							
1840	54.0	—4.	0.2	29.4	40.8	4	1.380	...	...	...	...	....
1841	61.3	+3.	79.9	37.5	42.4	9	3.840	...	...	...	...	0.26 lbs.
1842	55.7	—2.	3.5	28.3	55.2	12	6.160	...	...	...	...	0.45
1843	59.1	+1.	7.8	33.1	54.7	10	9.760	...	...	...	...	0.57
1844	58.6	+0.	1.5	29.6	51.9	4	impft.	...	...	...	...	0.26
1845	56.0	—2.	8.8	35.3	43.5	16	6.245	...	...	...	...	0.34
1846	63.6	+5.	4.0	30.0	45.0	11	4.595	...	...	...	...	0.33
1847	55.6	—2.	74.8	38.1	36.7	15	6.665	...	...	...	...	0 33
1848	54.2	—3.	0.9	29.5	51.4	11	3.115	...	...	N 71° W	2.38	3.81 mls.
1849	58.2	+0.1	0.6	33.5	47.1	9	1.480	...	...	N 75° W	0.69	4.23
1850	56.5	—1.	76.0	31.7	44.3	11	1.735	...	...	S 65° W	1.02	4.78
1851	60.0	+1.	6.3	33.4	52.9	9	2.665	...	...	N 14° E	1.03	5.45
1852	57.5	—0.	1.8	36.1	45.7	10	3.630	...	...	N 77° W	0.53	4.60
1853	58.8	+0.	5.4	36.1	49.3	12	5 140	...	...	North.	1.06	4.33
1854	61.0	+2.	3.1	36.3	56.8	14	5.375	...	...	N 23° W	1.42	4.81
1855	59.5	+1.	1.7	36.1	45.6	12	5.585	...	...	N 20° E	1.29	7.61
1856	57.1	—1.0	7.3	37.4	39.9	13	4.195	...	...	S 79° W	1.98	6.53
1857	58.0	+0.	1.4	34.1	47.3	11	2.640	...	...	N 68° W	1.61	5.55
1858	59.1	+1.	0.1	29.9	43.3	8	0.735	...	...	S 74° W	1.53	5.69
M	58.18	...	1.32	34.28	47.04	10.6	4.181	...	...	....	...	5.26 Mls.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—AUGUST, 1858.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL. D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32° Fahr.			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind.	Rain in Inches.	Snow in Inches.	WEATHER, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A. M.	2 P. M.	10 P. M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.				6 A.M.	2 P.M.	10 P.M.
1	29.564	29.746	29.84[illegible]	63.0	80.3	62.1	.466	.677	.49[illegible]	.85	.66	.91	N N E	E b N	N E	2.36	1.60	0.85	...	...	...	Clear.	C. St. 6.	Clear.
2	.817	.996	.95[illegible]	56.7	74.0	62.4	.420	.469	.51[illegible]	.90	.57	.91	NE b E	NE b E	NE b E	3.77	12.16	4.36	...	...	...	C. St. 9.	Cirr. 4.	Do. Aur. Bor.
3	.922	.818	.892	55.2	69.1	59.6	.398	.549	.46[illegible]	.90	.75	.91	NE b E	SE b E	S E	1.80	1.18	0.71	...	0.070	...	Do. 6.	C. St. 10.	Rain.
4	.647	.668	.654	60.4	67.0	64.3	.487	.556	.55[illegible]	.94	.84	.92	W N W	S b E	S b W	7.17	16.76	12.23	...	0.860	...	Rain.	Dist. Thun.	Th. C. St. 6.
5	.626	.629	.685	61.0	77.0	69.0	.480	.646	.671	.91	.71	.95	W b S	W	W S W	6.06	3.67	8.55	...	...	...	C. C. St. 8.	Cirr. 4.	C. St. 4.
6	.671	.693	.672	65.4	74.7	64.7	.570	.614	.55[illegible]	.89	.68	.92	N W	N N W	S S W	2.77	9.62	0.87	...	0.200	...	St. 9.	C. St. 9.	Clear.
7	.806	.842	.963	60.2	78.1	65.6	.486	.550	.57[illegible]	.88	.58	.92	S E b E	W b S	S E b S	6.45	1.08	0.95	...	...	...	Clear.	Clear.	Do.
8	.977	.960	.925	57.0	87.8	72.3	.436	.902	.745	.94	.74	.92	S E b E	S b E	S S E	0.00	1.33	0.11	...	...	...	Cir. Str. 2.	Do.	C. St. 8.
9	.896	.795	.814	67.1	88.3	74.9	.563	.915	.751	.87	.69	.88	SE b S	S b E	S S E	0.00	0.08	0.10	...	...	...	C. St. 8.	C. C. St. 6.	Do. 10.
10	.871	.812	.763	69.0	93.0	74.2	.628	.942	.751	.88	.61	.88	S E	SE b S	S E	0.20	0.06	0.01	...	...	...	Str. 10.	Clear.	Do. 4.
11	.711	.713	.750	66.9	69.0	68.1	.570	.665	.655	.89	.92	.97	S E	E b S	S b E	0.17	2.10	0.98	...	0.490	...	C. C. St. 4.	Rain.	Ni. 10. Dist. Th.
12	.867	.840	30.098	67.2	83.0	62.8	.522	.558	.429	.79	.80	77	N b E	N b E	N N E	1.65	12.20	0.70	...	...	...	Clear.	Clear.	Clear. Aur. Bor.
13	30 138	30.119	.113	60.7	81.5	63.0	.426	.897	.549	.82	.53	.97	N E	E N E	E N E	0.11	1.33	0.00	...	...	...	Do.	Do.	Do. do.
14	.070	29.875	29.832	56.8	93.6	70.4	.413	.992	.621	.90	.64	.85	NE b E	SE b S	S E	0.00	0.02	0.00	...	...	...	Do.	Do.	Clear.
15	29 868	.842	.853	67.0	87.7	68.2	.619	.785	.577	.92	.60	.85	S E	S S W	W N W	0.00	0.00	0.00	...	Inp.	...	C. C. St. 9.	Cirr. 4	C. St. 10.
16	.881	.861	.949	60.0	79.0	59.8	.374	.574	.469	.73	.58	.94	W	W S W	S S W	1.01	0.01	0.73	...	...	...	Clear.	Clear.	Clear. Aur. Bor.
17	.914	.788	.72[illegible]	56.8	88.3	68.9	.391	.778	.606	.87	.59	.88	S S W	S W	S S W	0.00	0.46	0.83	...	...	...	Do.	Do.	Do.
18	.621	.559	.494	62.0	87.6	60.1	.491	.741	.473	.88	.57	.88	S W	SW b S	N b W	0.11	6.23	5.45	...	...	...	Do.	C. C. St. 6.	C. St. 10.
19	.577	.672	.700	45.0	57.6	50.9	.251	.322	.309	.84	.69	.85	N N W	W b S	W S W	0.70	0.12	0.02	...	0.160	...	St. 4.	C. C. St. 10.	Do. 8.
20	.640	.600	.59[illegible]	54.7	70.6	57.0	.328	.551	.44[illegible]	.89	.78	.97	S W	S b E	SE b E	0.00	0.00	0.00	...	0.630	...	C. St. 9.	Do. 6.	Nimb. 10. Rain.
21	.693	.687	.64[illegible]	50.7	71.0	62.4	.384	.537	.52[illegible]	.96	.71	.94	W S W	W S W	S b W	0.00	0.00	5.12	...	0.100	...	Rain.	Do. 6.	Do. do.
22	.707	.485	.880	56.9	66.1	55.0	.443	.470	.29[illegible]	.97	.73	.68	W	W	W N W	0.53	7.23	7.00	...	0.416	...	C. St. 10.	C. St. 10.	C. C. Str. 9.
23	.851	.810	.885	49.4	68.0	49.9	.240	.411	.272	.68	.60	.78	W N W	W N W	SW b W	9.07	11.81	3.40	...	...	...	Do. 4.	Do. 3.	Clear.
24	.907	.882	.88[illegible]	49.0	60.4	56.1	.278	.480	.44[illegible]	.71	.91	.97	W S W	W b S	SW b W	0.62	14.06	1.40	...	Inp.	...	Clear.	Do. 4.	Str. 2.
25	30.061	30.029	30.117	50.0	76.6	55.3	.303	.646	.348	.89	.71	.86	N N E	S S W	S b W	0.00	0.08	0.02	...	...	...	Do.	Clear.	Clear.
26	.078	29.908	29.91[illegible]	45.0	80.0	64.1	.258	.644	.503	.88	.64	.88	NE b E	NE b E	S	0.20	1.17	1.27	...	...	...	Do.	Do.	Do. Aur. Bor.
27	29.852	.783	.80[illegible]	60.3	71.6	63.5	.426	.503	.569	.82	.66	.97	SE b S	SE b S	SE b S	0.78	6.21	1.30	...	0.076	...	C. St. 10.	C. St. 10.	C. St. 10.
28	.704	.614	.53[illegible]	64.6	80.1	69.0	.590	.677	.642	.97	.66	.92	SE b S	SE b S	E S E	0.00	0.00	0.06	...	...	...	Do. 10.	C. C. St. 6.	Nimb. 10. Rain.
29	.471	.424	.581	59.5	75.0	63.0	.469	.673	.517	.94	.79	.90	S W b W	W S W	W S W	0.42	4.02	5.03	...	1.100	...	Do. 10.	Do. 4.	C. St. 9.
30	.439	.515	.651	60.4	73.2	61.0	.511	.648	.51[illegible]	.97	.79	.97	S W	S b W	S E b S	0.00	0.00	0.00	...	0.101	...	Rain.	C. Cum. 4.	Do, 9.
31	.787	.719	.754	55.9	79.4	65.0	.420	.651	.549	.91	.66	.96	E	E	S b W	6.03	0.05	0.18	...	...	...	C. St. 10.	C. St. 6.	Do. 6. A. Bor

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR SEPTEMBER.

Highest Barometer........................ 30.098 at 10 p.m., on 26th } Monthly range=
Lowest Barometer .... 29.167 at 2 p.m., on 16th } 0.931

Self-registering Thermom.
- Maximum Temperature............ 81°.4 on p.m. of 9th } Monthly range=
- Minimum Temperature............ 35°.6 on a.m., of 23rd } 45°.8
- Mean maximum Temperature .... 67°52 } Mean daily range=
- Mean minimum Temperature .... 50°79 } 16°.73
- Greatest daily range .... 29°.0 from a.m. to p.m. of 20th.
- Least daily range.................. 9°.4 from a.m. to p.m. of 16th.

Warmest day......... 9th ... Mean temperature......... 70.98 } Difference = 24°66.
Coldest day........... 22nd ... Mean temperature......... 46°32 }

Maximum { Solar................................. 101° 4 on p.m. of 9th } Monthly range=
Radiation. { Terrestrial........................ 24°.2 on a.m. of 23rd } 77°2.

Aurora observed on 8 nights, viz., on 1st, 7th, 8th, 10th, 12th, 13th, 20th, and 22nd.
Possible to see Aurora on 23 nights; impossible on 7 nights.

Snowing on —— days,—depth —— inches; duration of fall —— hours.

Raining on 8 days,—depth 0.735 inches; duration of fall 21.9 hours.

Mean of cloudiness = 0.41.

Most cloudy hour observed, 2 p.m., mean = 0.50; least cloudy hour observed 10 p.m., mean, = 0.30.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
1147.03	1448.27	721.12	1780.97

Resultant direction S. 74° W.; Resultant Velocity 1.53 miles per hour.
Mean velocity.............................. 5.69 miles per hour.
Maximum velocity .... 24.8 miles from noon to 1 p.m. on 16th.
Most windy day........................ 16th...Mean velocity 13.42 miles per hour.
Least windy day .... 23th...Mean velocity 1.62 ditto.
Most windy hour ... 2 to 3 p.m...............Mean velocity 10 32 ditto. } Difference
Least windy hour...midnight to 1 a.m. ...Mean velocity 2.13 ditto. } 8.19 miles.

Thunderstorms occurred on 30th from 1 to 3 p.m.

Sheet Lightning recorded on 3rd at 10 p.m.; 5th, at 8 p.m.; 8th, 7 p.m. to mid. night; 11th, 7 to 10 p.m.; and 15th, from 7 to 8 p.m.

Corona round the moon on 22nd at 10 p.m.

Heavy Dew recorded on 13 mornings during the month.

First Frost of the season on 18th, at 5.30 a.m., and noted also on the 23rd, 25th, and 26th.

Dense Fog on the 2nd at 5 to 8 a.m.; and on 28th, 7 to 9 p.m.

Brilliant Meteor observed in the W. at 9.15 p.m. on the 27th.

The Resultant Direction and Velocity of the Wind for the month of September, from 1848 to 1856, inclusive, were, respectively, N. 61° W. and 0.94 miles.

The month of September, 1858, was warm, clear, and dry—the depth of rain which fell being less than one-fifth of the average of the last 18 years.

COMPARATIVE TABLE FOR SEPTEMBER.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	M'n.	Diff. from Aver.	Max. ob'd.	Min. ob'd.	Range.	No. of days.	Inch's.	No. of days.	Inch's.	Resultant Direction.	Resultant V'y.	Mean Force or Velocity.
	°	°	°	°	°							
1840	54.0	−4.	0.2	29.4	40.8	4	1.880	...	...	...	...	....
1841	61.8	+3.	9.9	37.5	42.4	9	3.340	...	...	...	...	0.26 lbs.
1842	55.7	−2.	3.5	28.3	55.2	12	6.160	...	...	...	...	0.45
1843	59.1	+1.	7.8	33.1	54.7	10	9.760	...	...	...	...	0.57
1844	58.6	+0.	1.5	29.6	51.9	4	impft.	...	...	...	...	0.26
1845	56.0	−2.	8.8	35.3	43.5	16	6.245	...	...	...	...	0.34
1846	63.6	+5.	4.0	30.0	45.0	11	4.595	...	...	...	...	0.33
1847	55.6	−2.	74.8	38.1	36.7	15	6.665	...	...	...	...	0 38
1848	54.2	−3.	0.9	29.5	51.4	11	3.115	...	...	N 71° W	2.38	5.81 mls.
1849	58.2	+0.	0.6	33.5	47.1	9	1.480	...	...	N 75° W	0.69	4.23
1850	56.5	−1.	76.0	31.7	44.3	11	1.735	...	...	S 65° W	1.02	4.78
1851	60.0	+1.	6.3	33.4	52.9	9	2.665	...	...	N 14° E	1.03	5.45
1852	57.5	−0.	1.8	36.1	45.7	10	3.630	...	...	N 77° W	0.53	4.60
1853	58.8	+0.	5.4	36.1	49.3	12	5 140	...	...	North.	1.06	4.33
1854	61.0	+2.	3.1	36.3	56.8	14	5.375	...	...	N 23° W	1.42	4.81
1855	59.5	+1.	1.7	36.1	45.6	12	5.585	...	...	N 20° E	1.29	7.61
1856	57.1	−1.0	7.3	37.4	39.9	13	4.105	...	...	S 79° W	1.98	6.53
1857	58.6	+0.	1.4	34.1	47.3	11	2.640	...	...	N 68° W	1.61	5.55
1858	59.1	+1.	0.1	36.8	[illegible]	8	0.735	...	...	S 74° W	1.53	5.69
M	58.18	...	1.32	34.28	47.04	10.6	4.131	...	...	....	...	5.25 Mls.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—AUGUST, 1858.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL. D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32° Fahr.			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind.	Rain in Inches.	Snow in Inches.	WEATHER, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.				6 A.M.	2 P.M.	10 P.M.
1	29.564	29.746	29.848	63.0	80.3	62.1	.466	.677	.498	.85	.66	.91	N N E	E b N	N E	2.36	1.60	0.85	...	...	...	Clear.	C. St. 6.	Clear.
2	.817	.996	.951	56.7	74.0	62.4	.420	.469	.517	.90	.57	.91	NE b E	NE b E	NE b E	3.77	12.16	4.36	...	...	...	C. St. 9.	Cirr. 4.	Do. Aur. Bor.
3	.922	.818	.892	55.2	69.1	59.6	.398	.549	.461	.90	.75	.91	NE b E	SE b E	S E	1.80	1.18	0.71	...	0.070	...	Do. 6.	C. St. 10.	Rain.
4	.647	.668	.654	60.4	67.0	64.3	.487	.556	.556	.94	.84	.92	W N W	S b E	S b W	7.17	16.76	12.23	...	0.860	...	Rain.	Dist. Thun.	Th. C. St. 6.
5	.626	.629	.685	61.0	77.0	69.0	.480	.646	.671	.91	.71	.95	W b S	W	W S W	6.06	3.67	8.55	...	...	...	C. C. St. 8.	Cirr. 4.	C. St. 4.
6	.671	.693	.672	65.4	74.7	64.7	.570	.614	.558	.89	.68	.92	N W	N N W	S S W	2.77	9.62	0.87	...	0.200	...	St. 9.	C. St. 9.	Clear.
7	.806	.842	.963	60.2	78.1	65.6	.486	.550	.576	.88	.58	.92	S E b E	W b S	S E b S	6.45	1.08	0.95	...	...	...	Clear.	Clear.	Do.
8	.977	.960	.925	57.0	87.8	72.3	.436	.902	.745	.94	.74	.92	S E b E	S b E	S S E	0.00	1.33	0.11	...	...	...	Cir. Str. 2.	Do.	C. St. 8.
9	.896	.795	.814	67.1	88.3	74.9	.563	.915	.751	.87	.69	.88	SE b S	S b E	S S E	0.00	0.08	0.10	...	...	...	C St. 8.	C. C. St. 6.	Do. 10.
10	.871	.812	.763	69.0	93.0	74.2	.628	.942	.751	.88	.61	.88	S E	SE b S	S E	0.20	0.06	0.01	...	...	...	Str. 10.	Clear.	Do. 4.
11	.711	.713	.750	66.9	69.0	68.1	.570	.665	.655	.89	.92	.97	S E	E b S	S b E	0.17	2.10	0.98	...	0.490	...	C. C. St. 4.	Rain.	Ni. 10. Dist. Th.
12	.867	.840	30.098	67.2	83.0	62.8	.522	.558	.429	.79	.80	77	N b E	N b E	N N E	1.65	12.20	0.70	...	...	...	Clear.	Clear.	Clear. Aur. Bor.
13	30 138	30.119	.113	60.7	83.5	63.0	.426	.897	.549	.82	.53	.97	N E	E N E	E N E	0.11	1.33	0.00	...	...	...	Do.	Do.	Do. do.
14	.070	29.875	29.832	56.8	93.6	70.4	.413	.992	.621	.90	.64	.85	NE b E	SE b S	S E	0.00	0.02	0.00	...	...	...	Do.	Do.	Clear.
15	29 868	.842	.853	67.0	87.7	68.2	.619	.785	.577	.92	.60	.85	S E	S S W	W N W	0.00	0.00	0.00	...	Inp.	...	C. C. St. 9.	Cirr. 4	C. St. 10.
16	.881	.861	.949	60.0	79.0	59.8	.374	.574	.469	.73	.58	.94	W	W S W	S S W	1.01	0.01	0.73	...	...	...	Clear.	Clear.	Clear. Aur. Bor.
17	.914	.788	.722	56.8	88.3	68.9	.391	.778	.606	.87	.59	.88	S S W	S W	S S W	0.00	0.46	0.83	...	...	...	Do.	Do.	Do.
18	.621	.559	.494	62.0	87.6	60.1	.491	.741	.473	.88	.57	.88	S W	SW b S	N b W	0.11	6.23	5.45	...	...	...	Do.	C. C. St. 6.	C. St. 10.
19	.577	.672	.700	45.0	57.6	50.9	.251	.322	.309	.84	.69	.85	N N W	W b S	W S W	0.70	0.12	0.02	...	0.160	...	St. 4.	C. C. St. 10.	Do. 8.
20	.680	.600	.592	54.7	70.6	57.0	.328	.551	.443	.89	.78	.97	S W	S b E	SE b E	0.00	0.00	0.00	...	0.630	...	C. St. 9.	Do. 6.	Nimb. 10. Rain.
21	.693	.687	.646	50.7	71.0	62.4	.384	.537	.523	.96	.71	.94	W S W	W S W	S b W	0.00	0.00	5.12	...	0.100	...	Rain.	Do. 6.	Do. do.
22	.707	.485	.880	56.9	66.1	55.0	.443	.470	.295	.97	.73	.68	W	W	W N W	0.53	7.23	7.00	...	0.416	...	C. St. 10.	C. St. 10.	C. C. Str. 9.
23	.851	.840	.885	49.4	68.0	49.9	.240	.411	.272	.68	.60	.78	W N W	W N W	SW b W	9.07	11.81	3.40	...	...	...	Do. 4.	Do. 3.	Clear.
24	.907	.882	.887	49.0	60.4	56.1	.278	.480	.443	.71	.91	.97	W S W	W b S	SW b W	0.62	14.06	1.40	...	Inp.	...	Clear.	Do. 4.	Str. 2.
25	30.061	30.029	30.117	50.0	76.6	55.3	.303	.646	.348	.89	.71	.86	N N E	S S W	S b W	0.00	0.08	0.02	...	...	...	Do.	Clear.	Clear.
26	.078	29.908	29.938	45.0	80.0	64.1	.258	.644	.503	.88	.64	.86	NE b E	NE b E	S	0.20	1.17	1.27	...	...	...	Do.	Do.	Do. Aur. Bor.
27	29.852	.783	.804	60.3	71.6	63.5	.426	.503	.560	.82	.66	.97	SE b S	SE b S	SE b S	0.78	6.21	1.30	...	0.076	...	C. St. 10.	C. St. 10.	C. St. 10.
28	.704	.614	.532	64.6	80.1	69.0	.590	.677	.642	.97	.66	.92	SE b S	SE b S	E S E	0.00	0.00	0.06	...	...	...	Do. 10.	C. C. St. 6.	Nimb. 10. Rain.
29	.471	.424	.581	59.5	75.0	63.0	.469	.673	.517	.94	.79	.90	S W b W	W S W	W S W	0.42	4.02	5.03	...	1.100	...	Do. 10.	Do. 4.	C. St. 9.
30	.439	.545	.651	60.4	73.2	61.0	.511	.648	.511	.97	.79	.97	S W	S b W	S E b S	0.00	0.00	0.00	...	0.101	...	Rain.	C. Cum. 4.	Do. 9.
31	.787	.719	.754	55.9	79.4	65.0	.420	.651	.549	.94	.66	.96	E	E	S b W	6.03	0.05	0.18	...	...	...	C. St. 10.	C. St. 6.	Do. 6. A. Bor

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—SEPTEMBER, 1858.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL.D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32°			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind.	Rain in Inches.	Snow in Inches.	WEATHER, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.				6 A.M.	2 P.M.	10 P.M.
1	29.757	29.797	29.827	64.0	71.0	60.6	.523	.572	.511	.86	.76	.97	S W	S W	S W	0.02	1.67	0.31	...	0.220	...	C. Str. 6.	C. Str. 6.	C. St. 2. A. B.
2	.872	.863	.600	60.0	84.4	65.7	.456	.623	.549	.88	.53	.89	S W b S	S b W	S b W	0.03	0.51	0.67	...	...	...	Clear.	Clear.	Clear.
3	.554	.523	.592	63.5	61.3	61.8	.548	.671	.557	.97	.93	.97	S b W	S W	S S W	2.73	0.27	1.43	...	0.300	...	C. St. 10.	C. St. 10.	Do.
4	.606	.552	.598	59.0	79.5	63.0	.446	.651	.505	.91	.66	.83	S W	S W b S	S b W	0.22	0.86	0.90	...	...	...	Clear.	Do. 4.	C. St. 6.
5	.585	.578	.624	55.9	68.1	58.1	.420	.536	.452	.94	.84	.94	S S W	N W b W	W b S	0.09	6.73	3.01	...	0.310	...	Do.	Do. 4.	Clear. Thun.
6	.740	.815	.953	56.1	73.7	58.4	.413	.476	.452	.90	.50	.91	W S W	N N W	W S W	1.73	0.20	1.86	...	0.201	...	Do.	Do. 6.	Do.
7	.947	.840	.885	52.0	83.0	68.2	.334	.643	.577	.86	.58	.85	S W	W S W	S W	0.00	0.51	3.77	...	...	...	Do.	Light Cirr.	Do. Au. Bor.
8	.839	.815	.852	64.0	80.1	74.2	.529	.721	.614	.89	.53	.68	S W	S W	S W	7.50	0.52	6.08	...	...	...	Do.	C. St. 4.	C. St. 4.
9	.813	.823	.814	70.7	67.6	60.1	.621	.584	.511	.85	.87	.95	W S W	N E b E	N E b E	0.70	2.98	4.75	...	Inp.	...	C. St. 10.	Do. 8.	Do. 8.
10	.731	.614	.52[illegible]	63.0	89.0	76.2	.549	.721	.731	.97	.53	.8	E S E	E S E	S S E	0.00	0.00	0.00	...	0.017	...	Do. 10.	Do. 4.	Clear. Dis. Lt.
11	.749	.638	.670	61.1	63.1	60.4	.480	.457	.426	.91	.63	.82	W S W	W S W	W S W	0.01	2.74	1.92	...	0.066	...	Do. 3.	Do. 6.	Cr. St. 2. A.B.
12	.787	.674	.519	50.0	70.2	51.1	.341	.516	.321	.98	.70	.86	W	W	W	0.08	1.23	19.01	...	0.200	...	Rain.	C. C. St. 4.	St. 4. Do.
13	.860	.883	30.092	40.7	63.4	50.0	.219	.316	.302	.87	.49	.82	W b S	W S W	S W	0.26	0.77	0.81	...	...	...	Clear.	Do. 3.	Clear.
14	30.073	30.047	.017	40.1	76.4	56.0	.221	.614	.410	.91	.08	.89	E S E	S E	S	0.00	0.10	0.62	...	...	...	Do.	Clear.	C. St. 6.
15	29.934	29.815	29.782	54.0	72.6	62.7	.369	.483	.399	.89	.61	.72	S	S	S	0.00	6.43	6.51	...	...	...	C. C. St. 6.	Cir. Str. 4.	Do. 7.
16	.537	.129	.033	52.0	58.4	55.7	.384	.470	.427	.90	.97	.97	N E	N E b E	W b N	3.60	11.77	1.05	...	2.799	...	Ni. 10.	Do. 6.	Do. 3.
17	.433	.562	.783	54.2	58.1	49.7	.332	.309	.200	.87	.64	.82	W b N	W b N	S W b W	5.40	6.75	3.61	...	0.636	...	Rain.	C. C. St. 6.	Do. 10
18	30.024	30.097	30.118	40.0	59.7	49.6	.219	.588	.272	.87	.73	.78	W	W	W	0.00	4.00	0.00	...	...	...	Clear.	Clear.	Clear. Au. B.
19	.204	.161	.153	49.0	67.0	52.0	.298	.522	.334	.75	.79	.80	N E b N	S b W	S b W	0.00	0.04	0.08	...	...	...	Do.	Cir. Cum. 3.	C. Str. 10.
20	29.948	29.750	29.720	48.3	83.5	71.0	.23[illegible]	.630	.644	.85	.54	.80	S W b W	W S W	S W	3.67	2.60	1.26	...	...	...	Do.	C. C. St. 4.	Do. 2. Au. B.
21	.741	.707	.652	60.1	68.1	48.0	.426	.658	.316	.82	.90	.95	N E b E	N E b N	W	8.50	4.96	5.31	...	0.680	...	C. St. 10.	Rain.	Rain.
22	.844	.924	.997	42.3	44.6	40.0	.304	.100	.182	.70	.56	.73	N W	N W	W N W	1.06	0.12	0.03	...	Inp.	...	Clear.	C. C. St. 10.	Clear. Au. B
23	.976	.910	.871	31.0	70.1	40.0	.161	.580	.265	.95	.80	.75	W	W S W	W S W	2.90	2.16	0.87	...	...	...	Do.	Ci. Str. 6.	C. St. 6.
24	.698	30.034	30.001	47.4	60.3	43.2	.292	.285	.209	.92	.54	.75	S W b W	S W b W	N W	2.11	1.62	0.00	...	Inp.	...	Cir. Str. 10.	Clear.	Clear.
25	30.132	29.885	.163	52.4	57.8	45.2	.168	.238	.269	.89	.50	.88	W b S	...	S S W	2.22	0.01	0.20	...	...	...	Clear.	Cirr. 3.	Do.
26	.187	30.214	.240	37.7	64.1	50.1	.104	.411	.335	.86	.60	.93	W S W	...	...	0.00	0.01	0.00	...	...	...	C. St. 4.	Do. 4.	C. Str. 2.
27	.234	.194	.189	40.7	60.7	48.7	.210	.423	.303	.87	.59	.80	W b S	S E	S E	0.00	0.05	0.00	...	...	...	Do. 8.	Do. 2.	Clear.
28	.124	.015	29.934	41.8	69.9	54.3	.235	.391	.362	.91	.54	.87	E b N	S E	S E b E	0.01	0.23	0.61	...	...	...	C. C. Str. 8.	Cir. Str. 4.	C. St. 10.
29	29.785	29.611	.593	47.1	69.8	58.0	.254	.456	.416	.81	.63	.85	S b E	S S E	S E b E	0.42	2.22	1.22	...	0.410	...	C. Str. 6.	Do. 8.	Do. 10. Th.
30	.594	.579	.624	54.6	63.0	52.9	.390	.392	.321	.93	.69	.86	W b N	W b N	...	0.61	2.35	0.00	...	...	...	Do. 4.	Do. 2.	Do. 10.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR AUGUST.

Barometer	Highest, the 13th day	30.138
	Lowest, the 29th day	29.424
	Monthly Mean	29.789
	Monthly Range	0.714
Thermometer	Highest, the 14th day	93°7
	Lowest, the 19th day	38°8
	Monthly Mean	66°12
	Monthly Range	54°9
Mean of Humidity		.818
Greatest Intensity of the Sun's Rays		117°0
Lowest point of Terrestrial Radiation		37°9
Amount of Evaporation in inches		2.63

Rain fell on 14 days, amounting to 4.023 inches; it was raining 34 hours 59 minutes, and was accompanied by thunder on 5 days.

The most prevalent wind was S.E. by E.

The least prevalent wind was S.

The most windy day was the 4th; mean miles per hour, 12.05.

The least windy day was the 20th; mean miles per hour, 0.00.

Aurora Borealis visible on six nights.

The electrical state of the atmosphere has indicated moderate intensity.

Ozone was present in moderate quantity.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR SEPTEMBER.

Barometer	Highest, the 27th day	30.254
	Lowest, the 16th day	29.033
	Monthly Mean	29.830
	Monthly Range	1.221
Thermometer	Highest, the 10th day	90°.2
	Lowest, the 23rd day	30°.5
	Monthly Mean	59°13
	Monthly Range	59°7
Greatest Intensity of the Sun's Rays		104°.1
Lowest point of Terrestrial Radiation		30.1
Amount of Evaporation (in inches)		2.34
Mean of Humidity		.804

Rain fell on 14 days amounting to 5.839 inches; it was raining 43 hours 25 minutes, and was accompanied by thunder on 3 days.

The most prevalent wind was S. W.

The least prevalent wind S. E.

The most windy day the 21st; mean miles per hour 6.19.

Least windy day the 10th; mean miles per hour 0.00.

Aurora Borealis was visible on 7 nights.

The electrical state of the Atmosphere has indicated feeble intensity.

Ozone was present in moderate quantity.

First frost 14th day.

Comet first seen on 5th September.

METEOROLOGICAL REGISTER, UNIVERSITY OF QUEEN'S COLLEGE, KINGSTON, CANADA WEST, FOR 1857.

Latitude, 44° 13′ 30″ *North. Longitude,* 76° 30′ 6″ *West. Height above Sea,* 294 *Feet.*

MONTH.	Barometer at 32° Corrected.		Thermometer.		Thermometer during 24 hours.		Tension of Vapor.		Humidity.		Clouds.		Direction of Wind.		Pressure in lbs avoirdup.		Rain in inches.	Snow in inches.
	9½ A. M.	3½ P. M.	9½ A. M.	3½ P. M.	Max.	Min.	9½ A. M.	3½ P. M.	9½ A. M.	3½ P. M.	9½ A. M.	3½ P. M.	9½ A. M.	3½ A. M.	9½ A. M.	3½ P. M.		
January	29.798	29.766	10.5	14.7	19.0	2.8	.084	.064	.711	.786	5.6	4.6	W	W	0.60	0.50	0.00	20.0
February	29.704	29.694	26.8	31.5	35.9	21.4	.153	.184	.907	.872	7.8	7.4	W b S	W S W	.30	.58	1.09	8.0
March	29.644	29.559	25.6	30.9	33.9	19.9	.145	.174	.875	.883	6.8	7.4	N W	W b S	.19	.09	0.50	12.5
April	29.601	29.549	36.7	39.7	42.3	31.3	.210	.237	.917	.936	6.0	6.7	W S W	S W	.08	.07	3.53	6.0
May	29.542	29.527	49.3	52.4	56.8	38.9	.317	.360	.834	.853	5.0	5.0	S W	S W	.04	.59	2.47	...
June	29.474	29.445	59.3	61.1	64.4	40.8	.451	.483	.884	.891	7.0	6.0	S S W	S W	.08	.23	2.33	...
July	29.674	29.630	71.3	74.7	76.3	62.6	.665	.680	.868	.849	3.8	3.8	S S W	S S W	.00	.00	2.38	...
August	29.633	29.616	66.4	70.4	72.0	59.4	.568	.606	.888	.822	5.3	5.6	S b W	S	.27	.20	6.00	...
September	29.776	29.693	59.1	63.4	66.2	55.4	.443	.496	.826	.813	4.5	4.5	S W b W	S W	.36	.25	1.66	...
October	29.754	29.757	45.6	48.7	51.3	39.9	.268	.298	.809	.785	6.6	6.7	S E	N E	.55	.28	1.98	...
November	29.595	29.598	36.1	38.6	42.2	29.6	.208	.224	.835	.851	6.5	9.0	W S W	W S W	.76	.91	3.36	...
December	29.716	29.694	29.7	30.8	35.6	22.7	.151	.163	.797	.817	7.0	6.5	W	N E	.36	.26	1.89	5.0
Total	355.911	355.528	516.4	556.9	595.9	433.7	3.668	3.971	10.146	10.157	71.9	73.2	......	......	3.59	3.96	26.19	51.5
Means	29.659	29.627	43.03	46.41	49.66	36.14	.306	.332	.845	.846	5.99	6.10	......	......	0.30	0.33		

Mean annual height of Barometer, ... 29.648. Reduced to level of the sea, ... 29.979
Mean annual height of Thermometer at 9½ A. M. and 3½ P. M., ... 44° 69
Mean temperature of the year .... 42° 67
Barometer, Maximum observed 12th February, 9h 30′ A. M. 30.430
Do do 19th Novem'r, 3h 30′ P. M. 28.684
Thermometer do 15th July, ... 85° 5
Do do 23rd January, ... −29°0 Minus.
Maximum in sun's rays, with unblackened bulb, 15th July, ... 104°
Wind Maximum 21st November, 9.25 lbs per square foot; velocity per hour, 29 miles.
Total amount of rain and snow, in inches of water, 34.69 inches.
Thunder and lightning on 11 days.
The greatest cold known for many years, occurred in January.

INDEX.

ERRATA.

Page 357, line 20, *for* "New Orleans," *read* "New Mexico."
" 359, two lines from bottom, *for* "Bachton," *read* "Buckton."
" 360, twenty lines from top, *for* "Nichel," *read* "Nickel."
" 360, six lines from bottom, *for* "bismnths," *read* "bismuths."
" 360, two lines from bottom, *for* "Bi'," *read* "Bi."

CONTENTS.

***** The Annual Subscription, due in January, Country Members, $3; in Toronto, $4.**

The next Number of this Journal will be issued in January.